Nuclear Operating Company

South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

October 28, 2004
NOC-AE-04001813

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
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South Texas Project
Units 1 and 2
Docket Nos. STN 50-498 and STN 50-499
Technical Adequacy of the South Texas Project Probabilistic Risk Assessment

Reference: Letter, T.J. Jordan to NRC, "Broad-Scope Risk-Informed Technical Specification Amendment Request," dated August 2, 2004 (NOC-AE-04001666) TAC Nos. MC3923 and MC3924

The referenced letter proposed to implement a risk-informed process for determining allowed outage times for South Texas Project (STP) Technical Specifications (TS). The risk-informed process involves the application of the STP Configuration Risk Management Program (CRMP), which is the same procedurally controlled program utilized by STP Nuclear Operating Company (STPNOC) for the implementation of 10CFR50.65(a)(4). STPNOC proposed the change as a pilot plant for the industry Risk-Informed Technical Specifications (RITS) and for evaluation of Regulatory Guide (RG) 1.200.

To support the NRC review of the referenced license amendment request, STPNOC hereby submits an analysis of the STP Probabilistic Risk Assessment (PRA) conducted in accordance with RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities." STPNOC believes the analysis confirms that the quality of the STP PRA is sufficient to provide confidence in the results such that the PRA can be used in regulatory decision making.

A001

If there are any questions regarding this submittal, please contact Wayne Harrison at (361) 972-7298 or me at (361) 972-7902.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on October 28, 2004

T. J. Jordan
Vice President
Engineering & Technical Services

Awh

Attachments:
1. General Description
2. Plant Changes that Have Not Been Incorporated
3. Conformance to Standards
4. Key Assumptions and Approximations
5. Resolution of Peer Review Comments

cc:

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Attachment 1
General Description

Regulatory Guide 1.200, PRA Quality Pilot
Risk-Informed Technical Specifications, Initiative 4B (RITS 4B)
Whole Plant Configuration Risk Management Pilot

Introduction

The purpose of this document is to facilitate NRC review of the adequacy of a Probabilistic Risk Assessment (PRA) for a risk-informed Technical Specification change. South Texas Project (STP) is a pilot plant for Industry Initiative 4B for Regulatory Guide (RG) 1.200, "An Approach for Determining the Technical Adequacy of PRA Results for Risk-Informed Activities." Specifically, STP Nuclear Operating Company (STPNOC) has developed risk management methods that allow the use of PRA technology in determining the risk associated with multiple components being removed from service concurrently. The technical approach uses a Configuration Risk Management Program (CRMP) in which the impact of equipment out of service is assessed in terms of core damage frequency (CDF) and/or large early release frequency (LERF). The integrated impact of multiple components being out of service is calculated in terms of cumulative risk to determine allowable outage times (AOTs) for a configuration within the constraints of predetermined risk thresholds. This document follows a format similar to that of RG 1.200.

The STP Risk-Informed Technical Specifications (RITS) application further extends the STP CRMP relative to Technical Specifications by establishing a configuration risk basis to Technical Specifications AOTs as opposed to system-based AOTs. This concept applies the same configuration risk management principles currently used at STP for 10CFR50.65(a)(4) of the Maintenance Rule. The STP PRA has features that facilitate the ability to perform on-line configuration risk management. Additionally, to support risk-informed applications, the STP risk models employ extensive use of software macros to simulate the station's operational maintenance practices, such that combinations of equipment removed from service can be quantified and stored in a knowledge base. This knowledge base is then accessed by a special software program that provides on-shift Operations crews with the ability to assess risk from changing plant configurations. "Configurations" as used in this submittal means equipment removed from service or otherwise declared inoperable that is within the scope of the CRMP. The model is quantified using the RISKMAN® software code that complies with station and industry software quality assurance requirements.

Description of the STP PRA

The scope of a PRA is defined by the challenges included in the analysis and the level of the analysis performed. Specifically, the scope is defined in terms of:

- the metrics used in characterizing the risk,
- the plant operating states for which the risk is to be evaluated, and
- the types of initiating events that can potentially challenge and disrupt the normal operation of the plant.

The metrics used for risk characterization in the STP PRA are CDF and LERF. As each technical element of the PRA is performed, the sources of uncertainty are identified and analyzed such that their impacts are understood at this level and on the risk results (CDF and LERF). The risk perspective is based on the total risk connected with the operation of the reactor

The STP PRA is a full-scope Level 1 / 2 PRA that incorporates internal events, (fires and floods), and external events (seismic, fire, flood). STP's PRA features a seismic PRA, flood PRA (including spatial interaction analysis), human reliability analysis, and detailed common cause modeling. The PRA is maintained and updated under a PRA configuration control program in accordance with station procedures. Periodic reviews are conducted and updates are performed, if necessary, for plant changes (including performance data, procedures, and modifications). The reviews and updates are performed by qualified personnel with independent reviews and approvals.

STPNOC has used the PRA for risk-informed insights and applications since the mid-1980s. The NRC has previously reviewed the STP PRA in support of approving the following risk-informed licensing applications:

1. Amendment Nos. 59 & 47, dated February 17, 1994, extended the AOTs for ten LCOs and the intervals for 3 surveillance tests.
2. Amendment Nos. 85 & 72, dated October 31, 1996, extended the AOT for the standby diesel generators and their associated support systems.
3. Amendment Nos. 125 & 113, dated September 26, 2000,relaxed LCO requirements for control room and fuel handling building HVAC.
4. Approval of Exemption to Special Treatment Requirements, dated August 3, 2001, relaxed regulatory requirements for various degrees of special treatment provisions for safety related components (Option 2 Pilot).
5. Amendment Nos. 135 & 124, dated January 10, 2002, extended the AOT for ECCS Accumulators consistent with WCAP-15049-A and relaxed accumulator surveillance requirements consistent with Westinghouse Improved Technical Specifications.
6. Amendment Nos. 143 & 131, dated September 17, 2002, allowed a one-time extension of the integrated leak rate test to 15 years.
7. Amendment Nos. 146 & 134, dated December 31, 2002, extended the AOT for auxiliary feedwater.
8. Amendment Nos. 158 and 146 dated December 2, 2003, eliminated the turbine missile design basis.
9. Amendment No. 149 for STP Unit 2 dated December 30, 2003, permitted a one-time extension of the AOT for standby diesel generator SDG 22 to 113 days.

In addition to the risk-informed licensing applications above, STPNOC has used the STP PRA to provide additional insight to other license amendments and to respond to NRC questions.

The following references are evaluations of the STP PRA that have been performed by the NRC and others:

1. NRC SER related to the STP Probabilistic Safety Assessment, dated January 21, 1992, documented favorable conclusions with regard to the STP PRA, including its treatment of fire (done to support the review for Amendment Nos. 59 & 47, above).

2. 2002 Peer Review

   In April 2002, STP's PRA underwent an industry peer review performed in accordance with NEI-00-02, "Industry PRA Peer Review Process." All technical elements within the scope of the peer review were graded as sufficient to support application requiring the capabilities of a grade 2 (e.g., risk ranking applications). Most of the elements were further graded as sufficient to support application requiring the capabilities defined for grade 3 (e.g., risk-informed applications supported by deterministic insights). The general assessment of the peer reviewers was that STP's PRA could effectively be used to support applications involving risk significance determinations supported by deterministic analyses once the items noted in the element summaries and Fact & Observations (F&O) sheets were addressed. Using STP's Corrective Action program as a tracking mechanism, with two major exceptions, all F&O items identified by the peer team have been completed and are incorporated as appropriate into the latest revision of the STP PRA (Revision 4). The STP PRA Revision 4 model is the basis for this application of Risk-Informed Technical Specifications. The two major exceptions that are not included in the current PRA are Level 2 model update for F&O items and reevaluation of internal flood modeling. The Level 2 update for F&O items is currently being performed with contractor assistance and will be complete by the end of 2004. The internal flood reevaluation is in progress and will be finished prior to the end of 2004. No issues have been identified from the flood reevaluation to date that affect the PRA. Attachment 5 provides additional information on the Peer Review.

RG 1.200 Required Information

Identification of Parts of the PRA Used to Support RITS 4B

Because the STP RITS 4B pilot application is a whole plant approach to configuration risk management, all SSCs that are within the scope of the Technical Specifications and also within the scope of the CRMP are reflected in the STP PRA. Some SSCs are explicitly modeled (safety injection pumps, standby diesel generators, etc.) while others are implicitly modeled (piping supports, snubbers, etc.). A listing of components explicitly modeled is available in the archival documentation supporting this license amendment. Thus, all technical elements of the STP PRA are used to support the RITS 4B pilot effort.

Demonstration of Technical Adequacy of the STP PRA

There are two aspects to demonstrating the technical adequacy of the parts of the PRA to support an application. The first aspect is the assurance that the parts of the PRA used in the application have been performed in a technically correct manner.The second aspect is the assurance that the assumptions and approximations used in developing the PRA are appropriate.

The technical adequacy of the STP PRA is ensured by the application of station procedural controls related to maintenance/upgrades, qualification of users, and software quality assurance. The procedural controls delineate the requirements for the scope, frequency, and approval of PRA updates. This ensures that the as-built, as-operated station is reflected in the PRA. These PRA program procedures/processes incorporate requirements and guidance for

- periodic reviews and updates, if necessary
- incorporation of plant physical changes and operational performance changes (including performance data, procedures, and modifications) that impact significant accident sequences
- qualification of personnel performing PRA analyses
- review and approval process for PRA evaluations

The PRA configuration control procedures are included in the archival documentation supporting this application.

STPNOC Submittal Documentation

In accordance with Regulatory Position C.4.2 of Regulatory Guide 1.200, the information described below is being provided to demonstrate that the parts of the STP PRA are of sufficient quality to support the analyses used in the STP RITS application.

RG 1.200 Submittal Requirement	Location
Identification of permanent plant changes (such as design or operational practices) that have an impact on those things modeled in the PRA but have not been incorporated in the baseline PRA model.	Attachment 2 Plant Changes that Have Not Been Incorporated
Documentation that the parts of the PRA required to produce the results used in the decision are performed consistently with the standard as endorsed in the appendices of this regulatory guide.	Attachment 3 Conformance to Standards
Identification of the key assumptionss and approximations relevant to the results used in the decision-making process.	Attachment 4 Key Assumptions and Approximations
A discussion of the resolution of the peer review comments that are applicable to the parts of the PRA required for the application.	Attachment 5 Resolution of Peer Review Comments

STPNOC Archival Documentation

In accordance with Regulatory Position C.4.1 of RG 1.200, STPNOC has retained archival documentation relevant to the PRA and its application to this application. The archival documentation is not provided in this submittal but has been collected in a form that may be reviewed by the NRC at their convenience.

The archival documentation includes a detailed description of the process used to determine the adequacy of the PRA. The documentation maintained is legible, retrievable (i.e., traceable), and of sufficient detail for the staff review of the bases supporting the results used in the application.

The archival documentation associated with this specific application includes enough information to demonstrate that the scope of the base PRA is sufficient with respect to:

- The plant design, configuration, and operational practices,
- The acceptance guidelines and method of comparison,
- The scope of the risk assessment in terms of initiating events and operating modes modeled,
- The parts of the PRA required to provide the results needed to support comparison with the acceptance guidelines,
- The description of the process for maintenance, update, and control of the PRA.

A full discussion of the PRA technical elements listed below is provided in the archival documentation.

Level 1 Technical Elements

- Initiating event analysis
- Success criteria analysis
- Systems analysis
- Parameter estimation analysis
- Accident sequences analysis
- Human reliability analysis
- Quantification
- Interpretation of results

Level 2 Technical Elements

- Plant damage state analysis
- Accident progression analysis
- Quantification
- Interpretation of results

The following archival documentation is included in the information available to the NRC staff in order to facilitate review of this risk-informed pilot application.

- Initiating Events Analysis Notebook
- A Systems Analysis Notebook for each system in the PRA
- Event Sequence Diagrams and Descriptions
- Accident Progression Analysis
- Plant Level Event Tree with associated documentation
- Data Analysis Notebook
- Human Reliability Analysis Notebook
- Level 2 Accident Sequences Notebook
- Level 2 Containment Event Tree Notebook
- Results and quantification information
- Uncertainty Analysis
- Importance Reports
- Description of the process for maintenance, update, and control of the PRA

The scope of risk contributors addressed by the STP PRA model for supporting the RITS 4B pilot application is provided in the archival documentation. The level of modeling that is required to support the RITS 4B application requires all initiating events applicable to the STP Level 1/2 at-power (Modes 1,2,& 3) internal/external event PRA that are contained in current requirements documents to be included.

The archival information also includes supporting information such as piping and instrumentation diagrams, electrical one-lines, logic diagrams, the STP Individual Plant Examination, etc.

Attachment 2

Plant Changes that Have Not Been Incorporated

The following permanent plant changes have not been incorporated into the PRA:

Instrument Air System Modification - The PRA models the instrument air system in support of "Smoke Purge" operation of the Electrical Auxiliary Building (EAB) or Control Room (CR) HVAC systems. The Smoke Purge function is used in the event of a loss of essential chilled water to the CR or EAB HVAC systems. Smoke Purge allows once-through cooling of equipment in the CR or EAB using outside air. The STP design does not rely on the instrument air system to perform safety-related functions.

The previous instrument air system contained two reciprocating air compressors in each unit with a manually operated crosstie to the service air system for each unit. The service air system also contained two reciprocating air compressors. In the event of low service air header pressure, the crosstie automatically closed to maintain the instrument air function. One of the two air compressors in each unit was backed up by the associated unit's Balance of Plant diesel generator. In the event of loss of offsite power, operator action to start the diesel-backed air compressor allowed use of the instrument air for non-safety loads.

The modification to the instrument air system replaces all four reciprocating air compressors with centrifugal compressors. Each compressor is tied into a filtration, drier, and receiver distribution network. The discharge of the receiver splits into the old instrument air/service air headers. The service air system is still isolated on low header pressure. One compressor is capable of supplying normal instrument air loads. One of the four compressors is air-cooled rather than water-cooled and is supplied power from the Balance of Plant diesel generator if offsite power is lost.

The reliability of the new instrument air system after the modification is equal to or somewhat better than the previous instrument air system, with the additional benefit of removing a cooling water dependency for the diesel-backed air compressor. Core damage frequency is expected to remain unaffected or to decrease slightly when this modification is incorporated in the next PRA model update.

Energize to Actuate Modification - STP has installed a modification to the feedwater isolation valves that changes the operation of the valves from "de-energize to actuate" to "energize to actuate." This modification reduces the likelihood of inadvertent operation of a feedwater isolation valve from ancillary equipment failures (e.g., solenoid valves, actuation relays). This feedwater isolation function is not currently modeled in the PRA, but will be included in the next model update.

An extension of this modification is planned for the next refueling outage in each unit that will change the operation of the main steam isolation valves (MSIVs) from "de-energize to actuate" to "energize to actuate". Currently, each MSIV receives a steam line isolation signal from the solid state protection system (SSPS) actuation trains A and B. There are two safety-related solenoid isolation valves in series in the air supply to each MSIV and two safety-related solenoid air dump valves in parallel for each MSIV. With the previous design, failure of a single solenoid valve could result in MSIV closure.Loss of power to Train A or Train B Class 1E DC would result in closure of all MSIVs. The effect of this modification has been analyzed using the PRA model and resulted in no significant change in CDF or LERF. This modification will be included in the next PRA model update.

SSPS Bypass Modification - A modification has been installed in both units that allows bypassing individual instrument channels and logic channels for testing. Previously, during testing of the SSPS, input test signals resulted in making up one of four (usually) actuation logic signals. This resulted in the input logic shifting from two-out-of-four to one-out-of-three. The SSPS bypass modification allows the input signals to be bypassed rather than tripped. This results in the input logic becoming two-out-of-three. This modification has been analyzed using the STP PRA and resulted in no significant change in CDF or LERF. It will be included in the next PRA model update.

Attachment 3

Conformance to Standards

Documentation of Conformance to ASME Standard

The STP PRA has undergone self-assessments and industry peer reviews to determine its level of compliance with existing industry standards and guidance. Each technical element has been assessed based on guidance in the ASME Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications, ASME RA-S-2002; the Westinghouse Owner's Group (WOG) Peer Review process; and the guidance contained in RG 1.200. The results of the peer review are available for inspection in the archival documentation and other assessments are included in electronic format as attachments to this submittal.

The STP PRA has been evaluated against the ASME Standard and RG 1.200. The NEI self-assessment items and the results of the review against the ASME Standard are contained in Table 1. The following items are outstanding based upon the results of this review.

1. Internal Flooding Analysis - A reanalysis of internal flooding at STP is being performed as a result of WOG peer review findings and the requirements of the ASME Standard as modified by RG 1.200. The flood walk-downs are complete, flood scenarios are being developed, and flood initiating event frequencies are being developed. The results of this analysis are expected to be available for review during the NRC site visit in November. To date, no internal flood scenarios have been identified that would exceed a CDF screening criteria of 1E-07.

2. Human Reliability Analysis (HRA) Sensitivity Studies - The WOG peer review and the ASME Standard identified the need for performing HRA sensitivity analysis on core damage sequences looking for possible dependent HRA actions. The results of this analysis are expected to be available for review during the NRC site visit in November.

3. HRA Update - The HRA task is being updated using new methodology available in the HRA calculator from EPRI and will be complete in support of the next model revision. The task schedule will be available for review during the team visit in November 2004.

4. Peer Review Level 2 Findings and Observation (F&O) Items - . The Level 2 update for F&O items is currently being performed with contractor assistance and are scheduled to be complete by the end of 2004.

Table 1 depicts the results of STP's self-assessment performed using RG 1.200 Tables A-1 and B-4. It also includes references to the related Peer Review F&O items and remarks.

PRA Technical Element	ASME SR	Included In NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
Initiating Events	IE-A1	Yes	IE-07, IE-08, IE-09, IE-10	Response: Covered under peer review	IE R-2, 3, 8, 9 and F&O IE-04
Initiating Events	IE-A2	Yes	IE-05, IE-07, IE-09, IE-10	Response: Listed initiators were included except internal flood initiators - which were screened out. Note that the LOCA Outside Containment and ISLOCA initiators are combined in the STP PRA - refer to VSEQS initiator top event. The RTRIP general transient initiator includes operator manual reactor trips. VSEQS initiator includes human error basic events for failure to close MOV to isolate leak path. Loss of support system initiators, e.g., LOECW, LOCCW, include operator failure to start standby train human error basic event based on plant Abnormal Procedures.	IE-R5, R2, R3, R9 F&O IE-01, IE-04
Initiating Events	IE-A3	Yes	IE-08, IE-09	Response: Covered under peer review	IE-R8, R9
Initiating Events	IE-A4	Partial	IE-05, IE-07, IE-09, IE-10	Response: Loss of a single train of class 1E DC power (A or B) is included as an initiating event. Also, the CCW support system initiator is quantified with one train in maintenance, one train running, and the potential for failure of the standby train. Loss of a single channel of Class 1E AC power will be evaluated as a potential initiating event based on recent plant experience.	IE-R5, R2, R3, R9 F&O IE-01, IE-04
Initiating Events	IE-A5	Yes	IE-08	Response: Table 5-2 in the Initiating Events Notebook Rev.4 shows examples of several part power trips used in the data update. However, section 3.2.1 of the notebook states that initiating events at shutdown are not included in the at-power scope.	IE-R8
Initiating Events	IE-A6	Yes	IE-16	Response: Input from industry reports, other PRAs, and knowledgeable risk personnel have ensured a complete set of initiators. In addition, extensive plant operating experience is used to update the current set of initiators. Recent plant operating experience is used to evaluate addition or removal of initiating events, e.g., loss of vital 120VAC, energize-to-actuate modification effect on loss of 1E DC. Specific operations personnel interviews have not been used to identify potential initiators.	IE-R7
Initiating Events	IE-A7	Yes	IE-16, IE-10	Response: Master logic diagram category MLD-17 "General Indirect Initiators" provides for an evaluation of precursor events. In addition, the support system FMEA was used to help identify support system precursor failures. Reference Rev.4 IE notebook.	IE-R7 F&O IE-04
Initiating Events	IE-A8	Yes	IE-10	Response: Covered under peer review	F&O IE-04
Initiating Events	IE-A9	Yes	IE-05, IE-10	Response: Covered under peer review	IE-R5 F&O IE-01, IE-04
Initiating Events	IE-A10	Yes	IE-06	Response: N/A	IE-R12
Initiating Events	IE-B1	Yes	IE-04, AS-04	Response: Covered under peer review	IE-R3, AS-R1 F&O AS-01
Initiating Events	IE-B2	Yes	IE-04, IE-07	Response: Covered under peer review	IE-R3, R2
Initiating Events	IE-B3	Yes	IE-04, IE-12	Response: N/A	IE-R3, R4
Initiating Events	IE-B4	Yes	IE-04	Response: Covered under peer review	IE-R3
Initiating Events	IE-C1	Yes	IE-13, IE-15, IE-16, IE-17	Response: Each of the STP support system initiators (LOEAB, LOCR, LOECW, LOCCW, L1DC) credit an operator action in the initiating event frequency calculation. The associated System Notebooks do not contain specific justification of this credit but reference the appropriate Abnormal Plant Response procedure.	IE-R10, R13, R7, R14, F&O IE-04
Initiating Events	IE-C2	Yes	IE-13, IE-16	Response: Covered under peer review	IE-R10, R7

PRA Technical Element	ASME SR	Included in NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
Initiating Events	IE-C3	No		Response: STP initiating event frequencies contained in the PRA model are based on per calendar year. The historical plant availability factor defined in top event GENST is used by the PMET event tree to ensure the quantification accounts for the fraction of time the plant is at-power. Refer to section 5.0 of the IE notebook Rev.4.	
Initiating Events	IE-C4	No		Response: Initiating event screening basis is provided in Table 3.4-1 IE Notebook Rev.4. Although the specific criteria listed in ASME IE-C4 requirement is not used in the STP PRA screening documentation, the documented basis in STP's PRA is correct and meets the intent of this requirement. Most screened initiating events are subsumed in a different quantified IE category.	
Initiating Events	IE-C5	No req. for Cat II	N/A	Response: N/A	
Initiating Events	IE-C6	Yes	IE-15, IE-17	Response: The support system initiator fault tree analyses have been developed similar to the mitigating system top event fault trees, except for the appropriate change in mission time and meet the appropriate systems analysis requirements.	IE-R13, R14 F&O IE-04
Initiating Events	IE-C7	No		Response: Initiator fault tree models use an appropriate mission time of 8760 hours to establish an annual event frequency.	
Initiating Events	IE-C8	No		Response: The fault tree initiators meet this requirement.	
Initiating Events	IE-C9	Yes	IE-15, IE-16	Response: The HEPs used in the support system initiator fault trees have been developed consistent with the HRA.	IE-R13, R7
Initiating Events	IE-C10	Yes	IE-13	Response: Covered under peer review	IE-R10
Initiating Events	IE-C11	Yes	IE-12, IE-13, IE-15	Response: The Excessive LOCA IE frequency (IELOCA) was based on expert judgement developed in the 1980s, although documentation could not be found that provides a basis for the value. The value should be compared to generic data sources (if available) and a basis documented. [CR 04-13754-1-1]	IE-R4, R10, R13
Initiating Events	IE-C12	Yes	IE-14	Response: The ISLOCA - VSEQS notebook contains the plant features used to determine the frequency as described in the ASME standard	IE-R6 F&O IE-02, IE-03
Initiating Events	IE-D1	Partial	IE-18, IE-19	Response: STP documentation meeting these requirements are contained in the IE notebook Rev.4	IE-R11 F&O IE-02
Initiating Events	IE-D2	Partial	IE-09, IE-20	Response: STP documentation meeting these requirements are contained in the IE notebook Rev.4	IE-R9
Initiating Events	IE-D3	Partial	IE-09, IE-18, IE-19	Response: STP documentation meeting these requirements are contained in the IE notebook Rev.4	IE-R9, R11 F&O IE-02
Initiating Events	IE-D4	Partial	AS-04, DE-05, SY-21	Response: N/A. IE-D4 does not exist in ASME-RA-Sa-2003.	AS-R1, DE-R3, SY-R21 F&O AS-01, DE-05

Accident Sequence Analysis	AS-A1	Yes	AS-04, AS-08	Response: The STP PRA is based on the linked event tree methodology via the use of . The event trees are built from Event Sequence Diagrams (ESDs) which are based, in part, on emergency operating procedures. The STP PRA represents the as-built, as-operated power plant. Peer Certification Comment (R13): Documentation of the accident sequence model including guidance, is detailed and fairly extensive, including the ESDs and the event trees.	AS-R1, R3, R13 F&O AS-01, AS-06

PRA Technical Element	ASME SR	Included In NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
Accident Sequence Analysis	AS-A2	Yes	AS-06, AS-07, AS-08, AS-09, AS-17	Response: Each of the 50+ initiating events are grouped into response event trees representing each of the following events: - General Transients - Steam Generator Tube Ruptures - Small LOCAs - Medium LOCAs - Large LOCAs The key safety functions are defined in the appropriate Event Tree Notebook. All functions necessary to successfully mitigate the accident/transient are questioned.	AS-R3, R7 F&O AS-03, AS-09, AS-10, SY-06, AS-06, AS-04, TH-04
Accident Sequence Analysis	AS-A3	Yes	AS-07, AS-17, SY-17	Response: The system function necessary to mitigate the initiating event are contained within each Event Tree or System Notebook, the Success Criteria Notebook and the model	AS-R7, SY-R17 F&O AS-10, SY-02, SY-08
Accident Sequence Analysis	AS-A4	Yes	AS-19, SY-05	Response: Operator actions are defined in the Event Sequence Diagrams and section 3.3.4 of the Individual Plant Examination. Human reliability data was updated in the late 90s (PRA-99-010) and this currently being updated via the HRA Calculator	AS-R12, SY-R5 F&O AS-07, SY-05
Accident Sequence Analysis	AS-A5	Yes	AS-05, AS-18, AS-19, SY-05	Response: The accident sequence model is based on the Event Sequence Diagrams as outlined in the IPE.	AS-R2., R8, R12, SY-R5 F&O AS-07, SY-05
Accident Sequence Analysis	AS-A6	Yes	AS-08, AS-13, AS-04	Response: Covered under peer review	AS-R3, R4, R1 F&O AS-06, AS-01
Accident Sequence Analysis	AS-A7	Yes	AS-04, AS-05, AS-06, AS-07, AS-08, AS-09	Response: The software creates accident sequence reports. These reports can be generated for individual initiators, groups of initiators, and all initiators. Accident sequences are reviewed at the end of each model update to verify sequences make logical sense.	AS-R1, R2, R3 F&O AS-01, AS-03, AS-09, AS-10, AS-06, AS-04, SY-06, TH-04
Accident Sequence Analysis	AS-A8	Partial	AS-20, AS-21, AS-22, AS-23	Response: End states in the STP PRA model for CDF are defined as either successful or melt (i.e., core damage). End states for level 2 are defined as type of release or successful containment performance (e.g., large early, late.).	AS-R9, R10, R11 F&O TH-01
Accident Sequence Analysis	AS-A9	Yes	AS-18, TH-04	Response: Success criteria are based on the UFSAR, MAAP analyses, or other special analysis (i.e., room heat-up calculations).	AS-R8, TH-R5
Accident Sequence Analysis	AS-A10	Yes	AS-04, AS-05, AS-06, AS-07, AS-08, AS-09, AS-19, SY-05, SY-08, HR-23	Response: System and operator response for each initiator is explicitly modeled in the STP PRA event trees or system analysis.	AS-R1, R2, R3, R12, SY-R5, HR-R6 F&O AS-01, AS-03, AS-09, AS-10, AS-06, AS-04, SY-06, SY-05, TH-04
Accident Sequence Analysis	AS-A11	Yes	AS-08, AS-10, AS-15, DE-06, AS Checklist Note 8	Response: In the software, event trees are linked for each initiator. Status of the previous event tree top events is maintained within the software. In addition, macros are used to simplify the split fraction rules. No information is lost by transferring from one event tree to another.	AS-R3, DE-R4 F&O AS-06, AS-05, DE-06
Accident Sequence Analysis	AS-B1	Yes	IE-04, IE-05, IE-10, AS-04, AS-05, AS-06, AS-07, AS-08, AS-09, AS-10, AS-11, DE-05	Response: Initiators that affect mitigating systems or functions are explicitly modeled within the STP PRA model. This is accomplished via top event boundary conditions and/or split fraction rules.	IE-R3, R5, AS-R1, R2, R3, DE-R3 F&O IE-01, IE-04, AS-01, AS-03, AS-09, AS-10, AS-06, AS-04, AS-05, AS-02, SY-06, TH-04, DE-05

PRA Technical Element	ASME SR	Included In NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
Accident Sequence Analysis	AS-B2	Yes	AS-10, AS-11, DE-04, DE-05, DE-06	Response: These dependencies are documented in the Event Sequence Diagrams and handled in the event trees. For example, success for Small LOCA requires high head, depressurization through heat removal, and low head. See SUCC macro in PDSSL.	DE-R2, R3, R4 F&O AS-05, AS-06, AS-02, DE-05, DE-06
Accident Sequence Analysis	AS-B3	Yes	AS-10, DE-10, SY-11, TH-08	Response: Covered under peer review	DE-R9, SY-R11, TH-R2 F&O AS-05, AS-06, DE-06, SY-09, TH-02
Accident Sequence Analysis	AS-B4	Yes	AS-08, AS-09, AS-10, AS-11	Response: In the STP PRA model, all train dependent top events are ordered from A to B to C. In addition, all conditional split fractions are calculated in the same manner.	AS-R3 F&O AS-06, AS-04, AS-05, AS-02, TH-04
Accident Sequence Analysis	AS-B5	Yes	AS-10, AS-11, DE-04, DE-05, DE-06, QU-25	Response: Split fraction logic rules in the STP PRA model accounts for the train specific dependencies. This is documented in the event tree notebooks.	DE-R2, R3, R4 F&O AS-05, AS-06, AS-02, DE-05, DE-06
Accident Sequence Analysis	AS-B6	Yes	AS-13	Response: The STP PRA model does include time-phased dependencies. For example, Diesel Generator recovery is modeled in top events OM and RE; DC battery depletion is modeled in Top Events DA, DB, DC, and DD; and Electrical Auxiliary Building room cooling is explicitly modeled in top events FA, FB, and FC for EAB.	AS-R4
Accident Sequence Analysis	AS-C1	Yes	AS-24, AS-25	Response: A review of the top rank sequences is performed and documented in Level 1 results notebook. The top sequences are reviewed against the Event Sequence Diagrams to ensure the split fraction logic rules are correctly modeling the event. In addition, an informal review of all accident sequences is performed at the end of the update process to ensure logical modeling	F&O SY-08, TH-04
Accident Sequence Analysis	AS-C2	Yes	AS-24, AS-25, AS-26	Response: The treatment for each initiator and event tree is documented in the Initiating Event and Event Tree Notebooks. Specifically, the initiator is defined in the former and the rules for each event tree in the later.	F&O SY-08, TH-04
Accident Sequence Analysis	AS-C3	Partial	AS-11, AS-17, AS-20, AS-24, DE-06, TH-05	Response: There is no one notebook that documents all the items within the check list. (a) The link between initiating event and accident sequence analysis is contained within the STP PRA model, i.e., in the initiating event dialog box of the event tree module. This dialog box contains a list of all the linked event trees used in quantifying the initiating event. (b) The definition of Core Damage is , the STP PRA assumes that any scenario in which the loss of core heat removal progressed beyond the point of core uncovery, and core exit temperatures exceeded 1,200°F, is a core damage scenario (documented in the Level 1 Results notebook). See response to Success Criteria Task (para.4.5.3) for more information on the relationship of success criteria to core damage (c) See Human Reliability section for more information on traceability of HRA (d) The STP PRA models sequences to success, any sequence not mapped to success is mapped to melt. The event tree notebooks contain more information on how success is defined (via the macro SUCC in the PDS event trees) (e) Documentation for integrated treatment in various notebooks and within the model	AS-R7, R9, TH-R6, DE-R4 F&O AS-02, AS-06, SY-08, TH-04, TH-05, HR-07, SY-08, DE-06

PRA Technical Element	ASME SR	Included in NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
Accident Sequence Analysis	AS-C4	Partial	AS-11, AS-24	Response: There is no one notebook that documents all the items within the check list (a) success criteria is contained within various documents, including the system and event tree notebooks (b) there is only one model, which can quantify both level 1 and 2 results. All initiating events are included within this model (c) the event sequence diagrams documented in the IPE describes the progression of each class of initiators (e.g., small break LOCA) (d) the event sequence diagrams contain assumptions however, the impact of these assumptions are not specifically described in the ESDs (e) analysis/calculations are contained within the system notebooks (e.g., reference to room heat up calculations), level 2 accident progression notebook, and event sequence diagrams within the IPE. (f) operation information is contained within the event sequence diagram and system notebooks. (g) see system notebooks for equipment operation (e.g., PDP operation within the CVCS system notebook) (h) for the most part, the STP model does not model systems under a single top event. There are some exception like RHR pump (OC) and heat exchanger (RX) and these are documented within the system notebook	F&O AS-02, AS-06, SY-08, TH-04

Success Criteria	SC-A1	Yes	AS-20, AS-22, AS Footnote 4	Response: CDF is defined in the Level 1 Quantification Notebook, along with reference to its basis. (F&O TH-01 Peer Review) Definition: The PRA assumes that any scenario in which the loss of core heat removal progressed beyond the point of core uncovery, and core exit temperatures exceeded 1,200°F, is a core damage scenario.	AS-R9, R10 F&O TH-01
Success Criteria	SC-A2	Yes	AS-22, TH-04, TH-05, TH-07, AS Footnote 4	Response: See Level 1 Quantification Notebook definition of CDF. Additional information resides in the Level 1 Thermohydraulic Analysis Notebook. There is not a single location for this information. (Known Issues from Peer Review TH-01, TH-04, TH-05, TH-06)	AS-10, TH-R5, R6, R3 F&O TH-01, TH-05, TH-03, HR-07, SY-08
Success Criteria	SC-A3	Yes	AS-06, AS-07, AS-17, AS-20	Response: See Event Sequence Diagrams and PRA model results for significant accident sequences. See definition of SUCCESS in the PDS event tree macros. See Initiating Events Notebook, associated Event Tree Notebooks (PDS), and Success Criteria Notebook. Table A-1 no impact	AS-R7, R9 F&O AS-03, AS-09, AS-10, SY-06
Success Criteria	SC-A4	Yes	AS-07,AS-17, AS-18, SY-08, SY-17, TH-09, IE-06, DE-05	Response: This is spread throughout PRA documentation. Defined primarily in the event trees and ESDs, the PRA event tree notebooks describe in detail the event and criteria for each of the mitigating functions, the event sequence diagrams, and what systems are required to mitigate the event. The Thermohydraulic Analysis Notebook describes certain analyzed scenarios, which support the basis for the system success criteria. The System and Success Criteria Notebooks detail what each system mitigating function is and their success criteria. The current PRA model does not share capabilities between units other than standby transformers because procedures did not exist at the time to perform such tasks. However, future model updates will incorporate these capabilities. Standby transformers are shared between units during planned maintenance, see PMET, and OFFSITE event trees and 4.16KV Electrical Power System Notebook. (Known Issues from Peer Review TH-03, TH-04, TH-05, TH-06, TH-07)	AS-R7, R8, SY-R8, R17, TH-R8, IE-R12, DE-R3 F&O AS-10, SY-06, SY-02, SY-08, TH-04, TH-05, DE-05

PRA Technical Element	ASME SR	Included In NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
Success Criteria	SC-A5	Partial	AS-21, AS-23, AS-20	Response: Mission times for systems are discussed throughout the System Notebooks, Success Criteria Notebooks, and Level 1&2 Quantification and Results Notebooks. Mission time for most systems is set at 24 hours. Some exceptions – batteries with no chargers (4 hours based on calculations); Level 2 analysis power recovery following station blackout of 4 hours top event CV (table 2.2-1).(Known Issues from Peer Review TH-01, TH-02, TH-05, TH-06)	AS-R9, R11
Success Criteria	SC-A6	Yes	AS-05, AS-18, AS-19, TH-04, TH-05, TH-06, TH-08, ST-04, ST-05, ST-07, ST-09, SY-05	Response: See Thermohydraulic Analysis Notebook and supporting documentation for model. (Known Issues from Peer Review TH-03, TH-04, TH-07)	AS-R2, R8, R12, TH-R5, R6, R2, ST-R2, R3, SY-R5 F&O AS-07, AS-04, TH-05, TH-07, TH-03, TH-02, HR-07, SY-08, SY-05, ST-01, IE-03
Success Criteria	SC-B1	Yes	AS-18, SY-17, TH-04, TH-06, TH-07	Response: Covered under peer review. Table A-1 comments: MAAP4 code was developed and verified by qualified trained users.	AS-R8, SY-R17, TH-R5, R7, R3 F&O SY-02, SY-08, TH-07, TH-03, AS-04
Success Criteria	SC-B2	No	TH-04, TH-08	Response: (Use of Expert Judgment) - Not used in STP PRA	TH-R5, R2 F&O TH-02
Success Criteria	SC-B3	Yes	AS-18, TH-04, TH-05, TH-06, TH-07	Response: See Thermohydraulic Analysis Notebook and supporting documentation. (Known Issues from Peer Review TH-01 to 07)	AS-R8, TH-R5, R6, R7 F&O TH-07, TH-03, TH-05, HR-07, SY-08, AS-04
Success Criteria	SC-B4	Yes	AS-18, TH-04, TH-06, TH-07	Response: Covered under peer review. Table A-1 response: see SC-B1	AS-R8, TH-R5, R7, R3 F&O TH-07, TH-03, AS-04
Success Criteria	SC-B5	Yes	TH-09, TH-07	Response: Known Issues from Peer Review TH-07	TH-R8, R3 F&O TH-04, TH-03, TH-05, SY-08
Success Criteria	SC-B6	Yes	QU-27, QU-28	Response: See Success Criteria, Thermohydraulic Analysis, and System Notebooks. See also PRA Analysis Assessments for sensitivity studies performed on the PRA model. Also see the IPE, which contains the initial analysis. (Known Issues from Peer Review TH-01, TH-02, TH-03, TH-05, TH-06, TH-07)	QU-R9 F&O QU-03
Success Criteria	SC-C1	Yes	ST-13, SY-10, SY-17, SY-27, TH-08, TH-09, TH-10, AS-17, AS-18	Response: See All PRA Notebooks, specifically Success Criteria and Thermohydraulic Notebooks and their references. See MAAP analysis Notebooks, Design Basis Documents and calculations, Table A-1 response: Key assumptions as defined in Reg. Guide 1.200T not yet documented.	ST-R1, SY-R10, R17, R22, TH-R2, R8, R9, AS-R7, R8 F&O SY-02, SY-08, TH-02, TH-04, TH-05, QU-03
Success Criteria	SC-C2	No	TH-10	Response: (Document Expert Judgment) - N/A, Not used in STP PRA	TH-R9
Success Criteria	SC-C3	Yes	AS-12, AS-13, TH-09, TH-10	Response: See IPE Documentation and Thermohydraulic analysis Notebook. (Known Issues from Peer Review TH-06, TH-07)	AS-R4, TH-R8, R9 F&O AS-08, TH-04, 05, SY-08
Success Criteria	SC-C4	Partial	AS-24, SY-27, TH-09, TH-10, HR-30	Response: See PRA Notebooks, specifically Level 1 and 2 Quantification, Success Criteria, Thermohydraulic Analysis, and IPE. (Known Issues from Peer Review TH-04)	SY-R27, TH-R8, R9, HR-R17 F&O SY-08, TH-04, TH-05

PRA Technical Element	ASME SR	Included in NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
Systems Analysis	SY-A1	Yes	SY-04, SY-19	Response: See System Notebooks	SY-R4, R19
Systems Analysis	SY-A2	Yes	SY-05, SY-13, SY-16, AS-19	Response: See System Notebooks	SY-R5, R13, R16, AS-R12 F&O SY-05, SY-04, AS-07
Systems Analysis	SY-A3	Yes	SY-05, SY-06, SY-08, SY-12, SY-14	Response: By procedure 0PGP01-ZA-0305, section 4.0, all plant information sources used to define and establish the PRA must be reviewed during the model update process and periodically between model updates to insure that the PRA represents the "As Built" plant. See PRA Database of Inputs. Items c through h are contained in the systems analysis notebooks. Item a (components and system boundaries needs to be developed as part of submittal. Item b is described in the Support System Notebook.	SY-R5, R6, R8, R12, R14 F&O SY-05, SY-06, SY-03, AS-06, DA-03
Systems Analysis	SY-A4	Partial	SY-10, DE-11, SY Footnote 5	Response: Plant walk downs and interviews were conducted during the initial PRA development, and are periodically conducted during the design change process between model updates when a design change impacts the PRA and periodically during model updates. The GQA working group also reviews the PRA model and assumptions following a model update prior to risk ranking systems and components. This provides additional assurance that the system analysis correctly reflects the as-built, as-operated plant. System high level summaries, which include components, failure modes, and assumptions, are also reviewed as part of the CRMP program.	SY-R10, DE-R6, R11
Systems Analysis	SY-A5	Partial	SY-08, SY-11, QU-12, QU-13	Response: Within the STP PRA documentation of systems, every system model description includes those conditions that prevent system operation and function including both normal and alternate alignments. See System Notebooks sections 2 and 3	SY-R8, R11 QU-R2 F&O SY-09
Systems Analysis	SY-A6	Yes	SY-07, SY-08, SY-12, SY-13, SY-14	Response: See System Notebooks	SY-R7, R8, R12, R13, R14 F&O AS-06, SY-03
Systems Analysis	SY-A7	Yes	SY-06, SY-07, SY-08, SY-09, SY-19	Response: In the STP PRA only the AMSAC system fits this description and is only used in selective sequences. See EPONSITE top AM. All other systems are modeled in detail in fault trees.	SY-R6, R7, R8, R9, R19 F&O SY-06, SY-07
Systems Analysis	SY-A8	Partial	SY-06, SY-09	Response: Covered under peer review. System notebooks describe the boundaries of the systems/functions modeled in the notebook.	SY-R6, R9 F&O SY-03, SY-06, SY-07, DA-03
Systems Analysis	SY-A9	Yes	SY-06, SY-19, QU-12, QU-13	Response: See System Notebooks	SY-R6, R19, QU-R2 F&O SY-06

PRA Technical Element	ASME SR	Included in NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
Systems Analysis	SY-A10	Partial	SY-09	Response: Super components are used in the STP PRA to simplify system modeling. Whenever a super component is used, measures are taken to ensure that only those components relative to the function being modeled are used. A typical use of super components in the STP PRA would be collecting passive components, such as manual valves, into a single basic event for a train. Most of these can be split into individual basic events with the new version of RISKMAN (most of the splitting has been done in Rev 4.1). There is no mixing of systems, and actuation signals are modeled separately. Super components that are made up of multiple components that have different failure probabilities are generally split. Collecting component failure data at a higher level, i.e., EDG and associated auxiliaries, does not necessarily result in a super-component. The EDG system model actually splits sequencer, breaker, and engine into separate basic events. Super components are heavily scrutinized by the GQA expert panel during system and component risk ranking following a model update to ensure they are modeled correctly. See System Notebooks, and GQA risk ranking process.	SY-R9 F&O SY-07
Systems Analysis	SY-A11	Yes	SY-12, SY-13, SY-17, SY-23, AS-10, AS-13, AS-16, AS-17	Response: See System Notebooks	SY-R12, R13, R17, R23 F&O AS-06, AS-05, SY-02, SY-08
Systems Analysis	SY-A12	Partial	SY-06, SY-07, SY-08, SY-09, SY-12, SY-13, SY-14	Response: Passive critical components whose failure affects system operability such as heat exchangers+I93 and tanks are modeled in the STP PRA. Because of STPs design, and because piping failure rates are significantly lower than other passive components which are modeled, piping is not included in the STP PRA system models. See System Notebooks for example Safety Injection, Component Cooling Water, or Auxiliary Feedwater.	SY-R6, R7, R8, R9, R12, R13, R14 F&O SY-06, SY-07, SY-03 AS-06
Systems Analysis	SY-A13	Yes	SY-15, SY-16, DA-04	Response: See System Notebooks	SY-R15 F&O SY-04, DA-02
Systems Analysis	SY-A14	No	SY-08, HR-04, HR-05, HR-07	Response: See System Notebooks	SY-R8, HR-R3, R5 F&O HR-01
Systems Analysis	SY-A15	Yes	SY-08, HR-04, HR-05, HR-07	Response: See System Notebooks	SY-R8, HR-R3, R5 F&O HR-01
Systems Analysis	SY-A16	Yes	SY-08, HR-08, HR-09, HR-10	Response: See System Notebooks	SY-R8, HR-R6
Systems Analysis	SY-A17	Yes	SY-10, SY-11, SY-13, AS-13	Response: The STP PRA System Notebooks address for each system the conditions that cause the system to isolate or trip. The Support System Model Notebook contains the direct system dependency descriptions. Though some dependencies are covered in the system analysis, most direct dependencies are evaluated in the event trees. See Event Tree Notebooks for EPONSITE and MECHSUP.	SY-R10, R11, R13, AS-R4 F&O SY-09
Systems Analysis	SY-A18	Yes	SY-08, SY-22, DA-07	Response: See PMET Event Tree for planned unavailability, See system level unplanned unavailability in individual System Notebooks, System testing frequency and surveillances are located in the individual System Notebooks.	SY-R8, R22, DA-R3
Systems Analysis	SY-A19	Yes	SY-11, SY-13, SY-17, AS-18, DE-10, TH-08	Response: Under adverse conditions, the STP PRA assumes in most cases the affected systems fail. An example of an exception to this rule is EAB HVAC system calculation. This calculation established the mission time for loss of EABHVAC for affected system components. See EAB HVAC System Notebook Sections 2.1.6, 2.1.7, 2.4.4, and 3.4. Actual modeling of this dependency is performed in the event trees.	SY-R11, R13, R17, AS-R8, DE-R9, TH-R2 F&O SY-08, SY-02, DE-06, TH-02

PRA Technical Element	ASME SR	Included In NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
Systems Analysis	SY-A20	Partial	SY-05, SY-11, SY-13, SY-2, AS-19, TH-08	Response: The STP PRA systems were developed directly from the design basis documents and in most cases no credit is taken beyond the rated or designed capability. For example, the 125V batteries are credited for 4 hours (and are good for more), we credit single train success, we exclude ventilation requirements in select areas, etc. For Level 2 analysis, equipment survivability during severe accidents is discussed in section 4.1.4 of the IPE. Also see the Level 2 Analysis notebook where probabilities are used to determine the design limits of SSCs like the containment and the associated justification. Table A-1 response: no impact.	SY-R5, R11, R13, AS-R8, TH-R2 F&O SY-05, SY-09, TH-02
Systems Analysis	SY-A21	Yes	SY-18	Response: See System Notebooks	SY-R18
Systems Analysis	SY-A22	Yes	SY-24, DA-15, QU-18	Response: STP PRA models recovery actions by operators supported by actual plant data and response times. See top events starting with letter "O"	SY-R24, DA-R4
Systems Analysis	SY-B1	Yes	SY-08, DA-08, DA-14, DE-08, DE-09	Response: See System Notebooks	SY-R8, DA-R7, R12, DE-R7, R8 F&O DA-01
Systems Analysis	SY-B2	No req. for Cat II		Response: See System Notebooks	
Systems Analysis	SY-B3	Yes	DE-08, DE-09, DA-10, DA-12	Response: See System Notebooks	DE-R7, R8, DA-R9
Systems Analysis	SY-B4	Yes	SY-08, DA-08, DA-10, DA-11, DA-12, DA-13, DA-14, DE-08, DE-09, QU-09	Response: See System Notebooks and Data Analysis Notebook	SY-R8, DA-R7, R9, R10, R11, R12, DE-R7, R8, QU-R1 F&O DA-01
Systems Analysis	SY-B5	Yes	SY-12, DE-04, DE-05, DE-06	Response: See Event Tree Notebooks, System Notebooks. For Maintenance dependency see PMET event tree. See Event Sequence Diagrams.	SY-R12, DE-R2, R3, R4 F&O AS-06, DE-05, DE-06
Systems Analysis	SY-B6	Yes	SY-12, SY-13	Response: Support system success criteria are established based upon the variability in the conditions present during the postulated accidents for which the system is required to function. In most cases, UFSAR success criteria are used to establish success criteria for support systems, in other cases, plant specific analyses for unique plant conditions establish the success criteria for support systems (e.g., room cooling requirements).	SY-R12, R13 F&O AS-06
Systems Analysis	SY-B7	Yes	SY-13, SY-17, AS-18, TH-07, TH-08	Response: See System Notebooks	SY-R13, R17, AS-R8, TH-R3, R2 F&O SY-02, SY-08, TH-03, TH-02
Systems Analysis	SY-B8	Yes	SY-10, DE-11	Response: See Spatial Interactions Database, Event Tree Notebooks, System Notebooks, External Events, Internal Fires and Floods Initiating Events. Event Sequence Diagrams.	SY-R10, DE-R6, DE-R11
Systems Analysis	SY-B9	Yes	SY-10, AS-20, L2-08, L2-09, L2-11, L2-13	Response: See Level 2 Analysis and Accident Progression Notebooks, Containment Event Tree Notebook. Event Sequence Diagrams.	SY-10, AS-R9, L2-R5 F&O L2-01, L2-02, L2-05, L2-03
Systems Analysis	SY-B10	Yes	SY-12, SY-13	Response: See System Notebooks, System Description.	SY-R12, R13 F&O AS-06
Systems Analysis	SY-B11	Yes	SY-08, SY-12, SY-13	Response: Systems that are required for initiation or actuation of systems are specifically modeled in the STP PRA, See QDPS, SSPS, and Reactor Trip System Notebooks. These notebooks describe the conditions needed for automatic actuation along with permissives and lockouts. Event Trees EPONSITE and MECHSUP present the dependencies other systems have on the actuation systems. Event tree macros are also used to define	SY-R8, R12, R13 F&O AS-06

PRA Technical Element	ASME SR	Included In NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
				boundary conditions for systems/trains	
Systems Analysis	SY-B12	Yes	SY-13	Response: The STP PRA models inventory of tanks, battery capacity, air, power, and cooling systems. See the associated system notebooks for load and mission time capabilities.	SY-R13
Systems Analysis	SY-B13	No		Response: Proceduralized recovery actions are modeled in the PRA. Proceduralized recovery actions not eliminate a support system from the model. See applicable System Notebooks.	
Systems Analysis	SY-B14	Partial	DE-06, AS-06	Response: Not directly applicable at STP due to system design and system boundary definitions. Exception examples, CCW to RHR heat exchanger in RHR top OC, and also in Hx top RX. LHSI pumps in injection and recirculation – event tree rules. Support system dependency is treated in the Event Trees PMET, EPONSITE, and MECHSUP. Within the System Notebooks, descriptions of basic event components like a common suction valve that can disable multiple trains of that system are discussed. See Auxiliary Feed Water or Safety Injection System Notebooks for examples.	DE-R4, F&O DE-06, AS-03, AS-09
Systems Analysis	SY-B15	Yes	SY-11	Response: In general, no SSC is credited for operating beyond its design in the PRA without a calculation to support the assumption (Example see SI room cooling calculation for exception). See applicable System Notebooks, Event Tree Notebooks and PRA Analysis/Assessments for operation in adverse conditions.	SY-R11 F&O SY-09
Systems Analysis	SY-B16	Yes	SY-08	Response: Covered under peer review	SY-R8
Systems Analysis	SY-C1	Partial	SY-23, SY-25, SY-26, SY-27	Response: See System Notebooks	SY-R23, R25, R26, R27
Systems Analysis	SY-C2	Yes	SY-05, SY-06, SY-09, SY-27	Response: See System Notebooks and the PRA Model	SY-R5, R6, R9, R27 F&O SY-05, SY-06, SY-07
Systems Analysis	SY-C3	Yes	SY-18, SY-27	Response: See System Notebooks	SY-R18, R27
Human Reliability Analysis	HR-A1	Yes	HR-04, HR-05	Response: A pre-initiator human action analysis has been performed and incorporated into the system analysis. However, this particular analysis has not been updated since the IPE. A specific review of test and maintenance procedures was performed for the STP_1996 and STP_1997 models (all systems). A continuing review of test and maintenance procedures is a standard part of a PRA system analysis update and is performed by all analysts for their respective systems. An initiative is being considered to review and screen testing and maintenance practices to determine if additional pre-initiator HEPs should be incorporated in the systems analysis. [CR 04-13754-2-1]	HR-R3 F&O HR-01
Human Reliability Analysis	HR-A2	Yes	HR-04, HR-05	Response: Covered under peer review [See SSPS System Notebook]	HR-R3 F&O HR-01
Human Reliability Analysis	HR-A3	Yes	HR-05, DE-07	Response: Covered under peer review	HR-R3, DE-R5 F&O HR-01
Human Reliability	HR-B1	Yes	HR-05, HR-06	Response: The systems analysis procedure reviews contain the applicable screening.	HR-R3, R4 F&O HR-01,

PRA Technical Element	ASME SR	Included In NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
Analysis					HR-04
Human Reliability Analysis	HR-B2	Partial	HR-05, HR-06, HR-07, HR-26, DA-05, DA-06	Response: Covered under peer review	HR-R3, R4, R5, R16 F&O HR-01, HR-04
Human Reliability Analysis	HR-C1	Yes	HR-27, SY-08, SY-09	Response: Covered under peer review	HR-R16, SY-R8, R9 F&O HR-06, SY-07
Human Reliability Analysis	HR-C2	Yes	HR-07, HR-27, SY-08, SY-09	Response: Unscreened activity unavailability is included in the system maintenance alignments. Example is top AFWS. See also HR-B1	HR-R3, R5, R16, SY-R8, R9 F&O HR-06, SY-07
Human Reliability Analysis	HR-C3	Yes	HR-05, HR-27, SY-08, SY-09	Response: N/A	HR-R3, R16, SY-R8, R9 F&O HR-01, HR-06, SY-07
Human Reliability Analysis	HR-D1	Yes	HR-06	Response: Covered under peer review. Related F&O HR-02.	HR-R4 F&O HR-04
Human Reliability Analysis	HR-D2	Yes	HR-06	Response: Covered under peer review	HR-R4 F&O HR-04
Human Reliability Analysis	HR-D3	No		Response: The STP dynamic and recovery HEP development includes performance shaping factors (PSFs) that meet this requirement. Due to lack of documentation, it can not be determined if these PSFs were evaluated for pre-initiator HEPs. [CR 04-13754-2-2]	
Human Reliability Analysis	HR-D4	No		Response: From the available STP pre-initiator HEP documentation (IPE section 3.3.4.3), it does not appear that STP credited recovery of pre-initiator errors during development of a particular pre-initiator HEP, as allowed for in THERP. The available documentation is lacking in the details of the pre-initiator HEP development. [CR 04-13754-2-2]	
Human Reliability Analysis	HR-D5	Yes	HR-26, HR-27, DE-07	Response: Covered under peer review	HR-R16, DE-R5 F&O HR-06
Human Reliability Analysis	HR-D6	No		Response: Developed HEPs are typically a log normal distribution with associated range factor. The mean values are used in the PRA Level 1 and 2 quantifications.	
Human Reliability Analysis	HR-D7	No		Response: When using HEPs in the PRA, analysts judge the reasonableness of the values prior to use in the models. This reasonability check is inherent in the process, but not well documented. [CR 04-13754-2-3]	
Human Reliability Analysis	HR-E1	Yes	HR-09, HR-10, HR-16, AS-19, SY-05	Response: Covered under peer review	HR-R6, R10, AS-R12, SY-R5 F&O HR-04, AS-07, SY-05
Human Reliability Analysis	HR-E2	Yes	HR-08, HR-09, HR-10, HR-21, HR-22, HR-23, HR-25	Response: Covered under peer review	HR-R6, R14, R15 F&O HR-04
Human Reliability Analysis	HR-E3	Partial	HR-10, HR-14, HR-20	Response: This supporting requirement is met during the operator interview process.	HR-R6, R9, R13 F&O HR-07
Human Reliability Analysis	HR-E4	Partial	HR-14, HR-16	Response: This supporting requirement is met during the operator interview process.	HR-R9, R10 F&O HR-07, HR-04
Human Reliability Analysis	HR-F1	Yes	HR-16, AS-19, SY-05	Response: Covered under peer review	HR-R10, AS-R12, SY-05 F&O HR-04, AS-07, SY-05

PRA Technical Element	ASME SR	Included in NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
Human Reliability Analysis	HR-F2	Partial	HR-11, HR-16, HR-17, HR-19, HR-20, AS-19, SY-05	Response: The HEPs developed for dynamic human actions include scenario sheets that define the HFE. The items included are 1) scenario description, 2) high level specific tasks, and 3) time window for successful completion. Lacking are the specific timing of cues, listing of the specific procedure guidance, and listing of the available cues/indications. However, the availability of cues/indications and procedure guidance is specifically evaluated by the PSFs. Related F&O is HR-02. STP's plan is to migrate the HEPs to the EPRI HRA Calculator which will result in listing specific cues and procedure guidance. [CR 04-13754-2-4]	HR-R7, HR-R10, HR-R11, HR-R12, HR-R13, AS-R12, SY-R5 F&O HR-02, TH-05, HR-04, HR-05, AS-07, SY-05
Human Reliability Analysis	HR-G1	Yes	HR-15, HR-17, HR-18	Response: Covered under peer review	HR-R11 F&O HR-05, HR-07 TH-05
Human Reliability Analysis	HR-G2	Yes	HR-02, HR-11	Response: At STP, the FLIM method has been used to determine HEPs. This method accounts for cognition and execution errors via the Performance Shaping Factors. An example of the cognition-related PSFs is titled "Plant Man-Machine Interface and Indications". STP plans to migrate the HEPs to the EPRI HRA calculator - this tool provides explicit treatment of Pcog and Pexe via the CBDTM/THERP methods.	HR-R2, HR-R7 F&O HR-02, HR-03 TH-05
Human Reliability Analysis	HR-G3	Partial	HR-17, HR-18	Response: The FLIM PSFs evaluate the impact of (a) through (h). Items (i) and (j) are not explicitly evaluated in the FLIM PSF worksheets. The EPRI HRA Calculator evaluates all of these supporting requirement elements.	HR-R11 F&O HR-05, HR-07, TH-05
Human Reliability Analysis	HR-G4	Partial	HR-18, HR-19, HR-20, AS-13	Response: STP time windows generally meet this category II requirement (as clarified in HR-G4 App.A). Time windows are documented in PLG-0675 (original STP PSA) Volume 4, Appendix B, and the TH notebook (MAAP calculations for selected HEPs). The point in time for relevant indications are NOT provided. Also, the recent HRA update assessments do not provide a reference for the time windows. See related F&O HR-07. [CR 04-13754-2-5]	HR-R12, HR-R13, AS-R4 F&O HR-07, TH-05
Human Reliability Analysis	HR-G5	Partial	HR-16, HR-18, HR-20	Response: The requirement is met during the operator interviews which include a talk-through of the HEP scenario sheet and applicable procedures. Concurrence of the reasonableness of the listed time window is also requested during this process.	HR-R10, HR-R13 F&O HR-04, HR-07, TH-05
Human Reliability Analysis	HR-G6	Yes	HR-12	Response: This supporting requirement is met by the inherent review and approval process for developing HEPs. The peformance of this consistency check is not specifically documented. [CR 04-13754-2-6]	HR-R8
Human Reliability Analysis	HR-G7	Partial	HR-26, DE-07	Response: This systematic dependency analysis has not been performed - refer to F&O HR-06. [04-13754-2-7]	HR-R16, DE-R5 F&O HR-06
Human Reliability Analysis	HR-G8	No	HR-27	Response: This supporting requirement has not been met, and is dependent on completing HR-G7. Minimum value of 1E-04 for a single HEP has been described in the latest HRA update, PRA-99-010. [CR 04-13754-2-8]	HR-R16 F&O HR-06
Human Reliability Analysis	HR-G9	No		Response: The HEPs are developed in RISKMAN as lognormal distributions, and thus have an associated error factor. The mean values are used in the PRA quantifications.	
Human Reliability Analysis	HR-H1	Yes	HR-21, HR-22, HR-23	Response: Human recovery actions are included as appropriate in the STP PRA to reduce unnecessary conservatism.	HR-R14, HR-R6 F&O HR-04
Human Reliability Analysis	HR-H2	Yes	HR-22, HR-23	Response: STP use of recovery actions meet these supporting requirements. In general, recovery actions are only credited if approved procedures support the actions. Operators are trained on approved casualty mitigation procedures (EOPs, Off-normals, Annunciator Response). These procedures typically contain the applicable cues. Attention is given to the appropriate elements of HR-G3 for	HR-R6 F&O HR-04

PRA Technical Element	ASME SR	Included in NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
				PSFs.	
Human Reliability Analysis	HR-H3	Yes	HR-26	Response: Dependency analysis of multiple recovery HFEs in a sequence has not been systematically performed - refer to F&O HR-06.	HR-R16
Human Reliability Analysis	HR-I1	Partial	HR-28, HR-30	Response: Documentation of the HRA is contained in PLG-0675 Vol.4 Section 14, the IPEEE, and assessment PRA-99-010. Enough detail is contained in these documents to understand the STP HRA. Some of the documentation specified in this supporting requirement is not available for certain SRs. Examples include: 1) documentation of pre-initiator screening - see F&O HR-01, 2) dependency analysis - see F&O HR-06, 3) summarized source of timing information, and 4) basis for minimum probability for multiple HEPs occurring in a sequence. [CR 04-13754-2-10]	HR-R17
Data Analysis	DA-A1	Yes	DA-04, DA-05, DA-15, SY-08, SY-14	Response: Covered under peer review	SY-R8, SY-R14 F&O DA-02, SY-03
Data Analysis	DA-A2	No		Response: Lognormal distributions have predominantly been used for the STP PRA data analysis.	
Data Analysis	DA-A3	Yes	DA-04, DA-05, DA-06, DA-07, SY-08	Response: Plant specific data updates meet this requirement.	DA-R3, SY-R8 F&O DA-02
Data Analysis	DA-B1	Yes	DA-05	Response: Covered under peer review	
Data Analysis	DA-B2	Yes	DA-05, DA-06	Response: A review of plant specific data updates indicates that this requirement has been met.	
Data Analysis	DA-C1	Yes	DA-04, DA-07, DA-09, DA-19, DA-20	Response: Covered under peer review	DA-R3, DA-R8, DA-R6 F&O DA-02, DA-03, DA-04
Data Analysis	DA-C2	Yes	DA-04, DA-05, DA-06, DA-07, DA-14, DA-15, DA-19, DA-20, MU-05	Response: Covered under peer review	DA-R3, DA-R12, DA-R6, MU-R4 F&O DA-02, DA-03, DA-04
Data Analysis	DA-C3	Partial	DA-04, DA-05, DA-06, DA-07, MU-05	Response: The plant specific Data Update Notebook documents this requirement. See IE Notebook.	DA-R3, MU-R4 F&O DA-02
Data Analysis	DA-C4	No		Response: The plant specific Data Update notebook documents this requirement. Refer to Table 1 in the notebook.	
Data Analysis	DA-C5	No		Response: Review of the data updates indicate this requirement was followed.	
Data Analysis	DA-C6	Yes	DA-06, DA-07	Response: The plant specific Data Update notebook documents this requirement.	DA-R3
Data Analysis	DA-C7	Yes	DA-06, DA-07	Response: Covered under peer review	DA-R3
Data Analysis	DA-C8	No		Response: The plant specific data update has not identified a need to use operational records to determine the time that components were configured in their standby status. Reasonable assumptions based on support system operating status satisfies this requirement.	
Data Analysis	DA-C9	Yes	DA-04, DA-06, DA-07	Response: A review of plant specific data updates indicates that this requirement has been met.	DA-R3 F&O DA-02

PRA Technical Element	ASME SR	Included in NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
Data Analysis	DA-C10	No		Response: Surveillance test procedures are reviewed and credited appropriately for demands. Refer to the Data Update notebook Rev.4.	
Data Analysis	DA-C11	No		Response: Maintenance unavailabilities have been updated based on RAsCal data. RAsCal data meets this requirement.	
Data Analysis	DA-C12	No		Response: Maintenance unavailabilities have been updated based on RAsCal data. RAsCal data meets this requirement.	
Data Analysis	DA-C13	No		Response: Maintenance unavailabilities have been updated based on RAsCal data. RAsCal data meets this requirement.	
Data Analysis	DA-C14	Yes	DA-15, AS-16, SY-24	Response: Maintenance unavailabilities have been updated based on RAsCal data. RAsCal data meets this requirement.	AS-R6, SY-R24
Data Analysis	DA-C15	Yes	DA-15, IE-13, IE-15, IE-16, AS-16, SY-24, QU-18	Response: Repair times for the support system initiators have been collected from actual unplanned maintenance events. Recovery times for LOOP events have not been collected since STP has not experienced a LOOP initiator as defined in the model. The LOOP updates include recovery times from STP's grid data.	IE-R10, IE-R13, IE-R7, AS-R6, SY-R24
Data Analysis	DA-D1	No		Response: The Bayesian update process is used to calculate parameter estimates. The update process for component failures is generally limited to components that have experienced a large number of failures over the update period (e.g., MRPSAF criteria exceeded). For the data not updated with plant specific experience, STP should either update the data with plant specific experience or update with recent industry generic data. [CR 04-13754-3-1]	
Data Analysis	DA-D2	No		Response: STP's data variables have been developed consistent with this requirement. Most data is based on generic estimates or plant-specific updates.	
Data Analysis	DA-D3	Partial	QU-30	Response: All STP data parameters include the mean value and statistical parameters associated with a lognormal distribution as represented by a DPD.	QU-R10
Data Analysis	DA-D4	No		Response: This was addressed in the WOG peer review and associated F&O's. A data update guideline would better support this requirement. [CR 04-13754-3-2]	
Data Analysis	DA-D5	Partial	DA-08, DA-09, DA-10, DA-11, DA-12, DA-13, DA-14	Response: STP's CCF parameters are based on the Multiple Greek Letter model, which meets this requirement.	DA-R7, DA-R8, DA-R9, DA-R10, DA-R11, DA-R12 F&O DA-01
Data Analysis	DA-D6	Partial	DA-08, DA-09, DA-10, DA-11, DA-12, DA-13, DA-14	Response: The STP WOG PRA Peer review F&O DA-01 addresses this requirement.	DA-R7, DA-R8, DA-R9, DA-R10, DA-R11, DA-R12 F&O DA-01
Data Analysis	DA-D7	No		Response: STP's model update process and design change impact review ensures that appropriate data is used to support the system models.	
Data Analysis	DA-E1	Partial	DA-01, DA-19, DA-20	Response: STP's data update documentation lacks some of the requirements. The following documentation needs to be generated to meet the requirement: (a) system and component boundaries used to establish component failure probabilities (c) sources for generic parameter estimates (f) key assumptions made in the interpretation of data and the reasoning (based on engineering, systems modeling, operations, and statistical knowledge) supporting its use in parameter estimation (i) the rationale for any distributions used as priors for Bayesian updates, where applicable [CR 04-13754-3-3]	DA-R1, DA-R6 F&O DA-03, DA-04

Internal	IF-A1	No		Response: Flooding areas are defined by all three items	DE-R9, IF-5

PRA Technical Element	ASME SR	Included in NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
Flooding				identified in the standard.	F&O DE-06
Internal Flooding	IF-A2	No		Response: The Spatial Interactions Database covers this information. All equipment potentially affected by internal floods are identified. Since most of the internal flooding scenarios were screened out in the early screening process, spatial locations were not required. Only flood scenario, Z123-FW-01 required further analysis based on spatial information (Ref. IPE section 3.4.3.3). This scenario also screened out below the significance threshold.	DE-R9, IF-6 F&O DE-06
Internal Flooding	IF-A3	No		Response: Spatial Interactions Database contains SSCs within flood areas.	DE-R9, IF-6 F&O DE-06
Internal Flooding	IF-A4	No		Response: A plant walkdown was performed to verify/obtain spatial information, SSCs and potential flood sources. Reference: Original PSA and IPE	DE-R9 F&O DE-06
Internal Flooding	IF-B1	No		Response: Flooding Sources are identified in Spatial Interactions Database. Identification is performed by analyzing the type of flooding source (e.g., Fire Hoses, Moderate/High Energy Lines, etc.). Reference Table D-3 in Original PRA.	IF-7 F&O DE-02
Internal Flooding	IF-B2	No		Response: WOG PRA Peer Cert, CR 02-6188-7-3 Pipe breaks and tank ruptures appear to be the only cause of flooding considered in the 1988 analysis. Floods caused by human errors during maintenance, water hammer, and failures during off-normal operations were not considered as flooding initiators. Will be corrected in flooding update.	IF-7 F&O DE-03
Internal Flooding	IF-B3	No		Response: WOG PRA Peer Cert. CR 02-6188-7-2 The maximum flow rate of the flood was not considered. The screening analysis appears to be based on the flood water volume caused by the design basis flood. Flow rates, duration of the flow rates and ultimate water volumes produced during the flood were not stated. Reference to the drain size was not mentioned. Will be corrected in flooding update.	IF-9 F&O DE-04
Internal Flooding	IF-B4	No		Remarks: Floor drains are credited for limiting the propagation of internal floods but not for limiting the effect on flooding of the room with which the drains are located. This is being reevaluated in the internal flood hazard update (on-going).	IF-10 F&O DE-04
Internal Flooding	IF-C1	No		Response: WOG PRA Peer Cert. CR 02-6188-7-1 Propagation pathways: Flood propagation through drains, stairwells, and cracks under doors were considered. It is not apparent that pathways such as HVAC ducts, pipe chases and penetrations, pipe tunnels were considered in the same detail. All flood barriers were assumed to be in their functional position. That is, doors being open, structure failure of doors, dikes being removed for maintenance were not considered. Drains being blocked or drain line check valves being failed open were not considered. All rooms were screened based on room alone. No propagation analysis was done. STP's Initial Response: Spatial Interactions Database contains multiple examples of flood propagation from one zone to another. It is assumed that propagation of water from one room to another will flood all equipment within the room. Will be corrected in flooding update.	IF-11 F&O DE-01
Internal Flooding	IF-C2	No		Remarks: The STP PRA contains no internal flooding events, therefore, this is not an issue. Any justification for screening internal flooding scenarios is documented in the spatial interactions.	IF-12
Internal Flooding	IF-C3	No		Response: The Spatial Interactions Database conservatively fails equipment. (See IPE Table 3.4.1.7 Equipment Susceptibility)	IF-13

PRA Technical Element	ASME SR	Included In NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
Internal Flooding	IF-C4	No		Response: Propagation pathways were developed from plant walkdowns. No credit was given to operator with the exception of the Control Room (Manned 24 hours a day).	IF-14
Internal Flooding	IF-C5	No		Remarks: This information is documented in the Spatial Interactions Database.	IF-14
Internal Flooding	IF-C6	No		Response: With the exception of floods within the Control Room, no human mitigation was credited.	IF-14
Internal Flooding	IF-D1	No		Response: See section 8 in the Original PRA for documentation of the "structured, systematic" process for developing the spatial interactions database.	
Internal Flooding	IF-D2	No		Response: Flooding scenarios were binned into different classes (i.e., type of scenarios), including scenarios that result in initiating events. All internal flooding events were screened out early in the screening process. However, if further evaluation had been required, then systems alignments, including support systems, would have been performed. See PRA fire analysis for examples.	IF-14
Internal Flooding	IF-D3	No		Response: No internal flooding scenarios required grouping of initiating events. Therefore, this element is not a concern at STP.	
Internal Flooding	IF-D4	No		Remarks: STP does not have any shared systems or structures that would impact the internal flooding analysis.	
Internal Flooding	IF-D5	No		Response: WOG PRA Peer Cert. CR 02-6188-7-5 Flooding frequencies were based on a 1983 paper, which provided an overall frequency for flooding in the Aux, DG, turbine buildings. These frequencies were apportioned to rooms of interest based on square footage. Continued use of flooding frequencies based on 19-year-old data is not appropriate. Further, the method of apportioning the data may no longer reflect current industry experience. STP Response: Disagree with F&O. The flooding frequencies were developed from 2 sources: 1) LER database and then 2) updated/reanalyzed to support shutdown events at Seabrook (Ref PLG-0624). STP is currently in the process of updating the internal flooding analysis with TR-11880, Piping System Failure Rates. Will be corrected in flooding update.	IF-15 F&O DE-07
Internal Flooding	IF-E1	No		Remarks: The STP PRA contains no internal flooding scenarios, therefore, this is not an issue.	
Internal Flooding	IF-E2	No		Remarks: The STP PRA contains no internal flooding scenarios, therefore, this is not an issue.	F&O DE-04
Internal Flooding	IF-E3	No		Remarks: The STP PRA contains no internal flooding scenarios, therefore, this is not an issue.	
Internal Flooding	IF-E4	No		Remarks: The STP PRA contains no internal flooding scenarios, therefore, this is not an issue.	
Internal Flooding	IF-E5	No		Remarks: The STP PRA contains no internal flooding scenarios, therefore, this is not an issue.	IF-12
Internal Flooding	IF-E6	No		Remarks: The STP PRA contains no internal flooding scenarios, therefore, this is not an issue.	IF-12
Internal Flooding	IF-E7	No		Remarks: The STP PRA contains no internal flooding scenarios, therefore, this is not an issue.	F&O DE-09
Internal Flooding	IF-F1	No		Remarks: The Spatial Interactions Database is well documented. The WOG PRA Peer resulted in a Level of Significance of "S" with the following documentation: In all aspect of spatial dependencies, the STPEGS PRA (in 1988) performed a rigorous hazard analysis which considered jet water, spray water, explosive canisters, equipment drops, high temperatures and missiles. The work was largely completed in an extensive walk down. All rooms were walked down and documented.	

PRA Technical Element	ASME SR	Included in NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
Internal Flooding	IF-F2	No		Remarks: This information is documented in the IPE and Original PSA including Table D-6.	

Quantification Analysis	QU-A1	Yes	AS-04, AS-05, AS-06, AS-07, AS-08, AS-09, AS-10, AS-19	Response: STP PRA performs this by default in RISKMAN software	AS-R1, AS-R2, AS-R3, AS-R12 F&O AS-01, AS-03, AS-09, AS-10, SY-06, AS-06, AS-04, TH-04, AS-05,AS-07
Quantification Analysis	QU-A2	Yes	QU-08	Response: Conditional split fractions used in the event tree quantification process incorporate the effects of "The State of Knowledge" dependence in component failure data.	QU-R13 F&O AS-10
Quantification Analysis	QU-A3	Yes	QU-04, QU-08, QU-09, QU-10, QU-11, QU-12, QU-13	Response: Default capability of RISKMAN software	QU-R13, QU-R1, QU-R2 FO AS-10, HR-06, HR-07, QU-05
Quantification Analysis	QU-A4	Yes	QU-18, QU-19	Response: Recovery credited in STP PRA see System Notebooks and Event Tree Notebooks. Most operator recovery top events start with letter "O."	QU-R4
Quantification Analysis	QU-B1	Yes	QU-04, QU-05, QU-06	Response: RISKMAN software used and sensitivity cases after quantification using different methodologies are performed to insure appropriate solutions. User group tracks the limitations of the code and known problems and resolutions	F&O QU-01
Quantification Analysis	QU-B2	Yes	QU-21, QU-22, QU-23, QU-24	Response: Sensitivity studies are performed at various cutoff frequencies to insure stable results for final solution. See Level 1 and Level 2 Quantification Notebooks.	QU-R5, QU-R6, QU-R8
Quantification Analysis	QU-B3	Partial	QU-19, QU-22, QU-24	Response: Sensitivity studies are performed at various cutoff frequencies to insure stable results for final solution. See Level 1 and Level 2 Quantification Notebooks	QU-R4, QU-R5, QU-R6
Quantification Analysis	QU-B4	Yes	QU-04	Response: RISKMAN software uses both mean and rare event approximation solutions and is now capable of producing exact solutions utilizing binary decision diagrams (this capability is not used in the current model). Sensitivity studies are performed to insure reasonable results. See System Notebooks for System Level Quantification. Additional software passes SQA requirements to insure it produces reasonable results.	
Quantification Analysis	QU-B5	Yes	QU-14	Response: Covered under peer review	QU-R3
Quantification Analysis	QU-B6	Yes	QU-04, QU-20, QU-25, AS-08, AS-09	Response: Inherent property of event tree quantification	QU-R15, AS-R3 F&O AS-06, AS-04, TH-04
Quantification Analysis	QU-B7	Yes	QU-26	Response: This function performed in model update verification.	QU-R7
Quantification Analysis	QU-B8	No		Response: Not directly applicable to RISKMAN models. "Logic flags" in event trees are typically macros like those found in PMET event tree are either set to failure by the associated logic statements or are by definition "Not Failed". In system fault trees, "Logic Flags" are typically House events whose status is explicitly controlled by split fraction definition equations. See the various system notebooks or the event tree macros and split fraction rules.	
Quantification Analysis	QU-B9	Partial	SY-09	Response: See System Notebooks, and Event Tree Notebooks. Risk significance of components is accomplished using the RISKMAN software and appropriate mapping of conditional split fraction groups in the model. See also response to SY-A10.	SY-R9 F&O SY-07

PRA Technical Element	ASME SR	Included in NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
Quantification Analysis	QU-C1	Yes	QU-10, QU-17, HR-26	Response: Sensitivity studies are performed following model quantification. However see HR Section comments specifically HR-G6, 7, 8 comments and F&O HR-06.	HR-R16 F&O HR-06, HR-07
Quantification Analysis	QU-C2	Partial	QU-10, QU-17	Response: See HR Section comments and F&O HR-06.	F&O HR-06, HR-07
Quantification Analysis	QU-C3	Yes	QU-20	Response: Validated during model update, see Event Tree Notebooks and model using RISKMAN software.	QU-R15
Quantification Analysis	QU-D1	Yes	QU-08, QU-09, QU-10, QU-11, QU-12, QU-13, QU-14, QU-15, QU-16, QU-17	Response: See F&O QU-02, 04, 05, for related issues. A review is conducted during the model update process and prior to application updates such as GQA risk ranking.	QU-R13, QU-R1, QU-R2, QU-R3, QU-R14 F&O AS-10, HR-06, HR-07, QU-02, QU-04, QU-05
Quantification Analysis	QU-D2	Partial	QU-27, QU-28, SY-22	Response: A review is conducted during the model update process. Periodically interviews and simulator experiments are performed to validate operator actions, F&O HR-04, 06. This issue is an open item.	QU-R9, SY-R22 F&O QU-03, HR-04, HR-06
Quantification Analysis	QU-D3	Yes	QU-08, QU-11, QU-31	Response: See F&O QU-05. CR 02-618-9-5, open item	QU-R13 F&O AS-10, QU-05, QU-02, QU-04 CR 02-618-9-5
Quantification Analysis	QU-D4	Yes	QU-15	Response: Performed during Model update	QU-R14
Quantification Analysis	QU-D5	Yes	QU-08, QU-31	Response: See Level 1 Quantification Notebook for overall importance and system level importance. See component importance in PRA 03-013R1 analysis assessment for risk ranking of PRA modeled components used in GQA exemption from special treatment application.	QU-R13 F&O AS-10, QU-02, QU-04
Quantification Analysis	QU-E1	Yes	QU-30	Response: See F&O QU-03, Uncertainty is evaluated during model update process in accordance with procedure 0PGP03-ZA-0305	QU-R10 F&O QU-03
Quantification Analysis	QU-E2	Yes	QU-27, QU-28	Response: See F&O QU-03, Uncertainty is evaluated during model update process 0PGP03-ZA-0305	QU-R9 F&O QU-03
Quantification Analysis	QU-E3	Partial	QU-30	Response: See F&O QU-03, Uncertainty is evaluated during model update process 0PGP03-ZA-0305	QU-R10 F&O QU-03
Quantification Analysis	QU-E4	Partial	QU-28, QU-29, QU-30	Response: See F&O QU-03, Uncertainty is evaluated during model update process ZA-305 See Level 1 Quantification Notebook. Table A-1 response: Key *assumptions / uncertainty as defined in Reg. Guide 1.200* not yet documented.	QU-R10 F&O QU-03, QU-02
Quantification Analysis	QU-F1	Partial	QU-31, QU-32, QU-34	Response: See Level 1 and Level 2 Quantification Notebooks for overall results, System Notebooks for system level results. Table A-1 response: part G significant basic events causing accident sequences to be non-significant is not documented.	QU-R11 F&O QU-02, QU-04
Quantification Analysis	QU-F2	Yes	QU-31	Response: See Level 1 and Level 2 Quantification Notebooks for overall results, System Notebooks for system level results. Significant sequences reviewed in both system level quantification and event tree quantification during model updates.	
Quantification Analysis	QU-F3	Yes	QU-27, QU-28, QU-32	Response: See Level 1 and Level 2 Quantification Notebooks for overall results, System Notebooks for system level results. Key sources of uncertainty and key assumptions are not yet identified or analyzed in the PRA model.	QU-R9, QU-R11 F&O QU-03
Quantification Analysis	QU-F4	Yes	QU-12, QU-13	Response: See *Level 1* and Level 2 Quantification Notebooks for overall results, System Notebooks for system level results.	QU-R2

PRA Technical Element	ASME SR	Included In NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
Quantification Analysis	QU-F5	Yes	QU-04, MU-07	Response: RISKMAN program has been verified by the vendor SQA program and by site SQA evaluation of the model. Vender retains all documentation "proof" for code capability and yielding correct results. When a revision to the software takes place STP verifies same results with single model.	MU-R5 F&O MU-04
Quantification Analysis	QU-F6	No		Response: See application analysis assessments, and PRA assumptions.	

LERF Analysis	LE-A1	Yes	L2-07, L2-08, L2-22, AS-14, AS-20, AS-21, AS-22, AS-23	Response: See Draft Level 2 Report.	L2-R4, AS-R5, AS-R9, AS-R10, AS-R11 F&O L2-01, L2-02, L2-04 TH-01
LERF Analysis	LE-A2	Yes	L2-07, L2-08, AS-21	Response: See Draft Level 2 Report.	L2-R4, AS-R9 F&O L2-01, L2-02
LERF Analysis	LE-A3	Yes	L2-07, L2-08, L2-21	Response: See Draft Level 2 Report.	L2-R4 F&O L2-01, L2-02, L2-06
LERF Analysis	LE-A4	Yes	L2-07, L2-08, L2-21, AS-20, AS-21	Response: See Draft Level 2 Report.	L2-R4, AS-R9 F&O L2-01, L2-02, L2-06
LERF Analysis	LE-A5	Yes	L2-08, L2-21, AS-20	Response: See Draft Level 2 Report.	AS-R9 F&O L2-01, L2-02, L2-06
LERF Analysis	LE-B1	Yes	L2-08, L2-10, L2-15, L2-16, L2-17, L2-19	Response: See Draft Level 2 Report.	L2-R6, L2-R7, L2-R3 F&O L2-01, L2-02, L2-03
LERF Analysis	LE-B2	Yes	L2-13, L2-14	Response: See Draft Level 2 Report.	L2-R7 F&O L2-03
LERF Analysis	LE-B3	Yes	L2-14, L2-15, ST-04	Response: See Draft Level 2 Report.	L2-R7, ST-R2 F&O TH-03
LERF Analysis	LE-C1	Yes	L2-24	Response: See Draft Level 2 Report.	L2-R8
LERF Analysis	LE-C2	Yes	L2-09, L2-12, L2-25	Response: See Draft Level 2 Report.	L2-R5 F&O L2-05
LERF Analysis	LE-C3	Yes	L2-08, L2-24, L2-25	Response: See Draft Level 2 Report.	L2-R8 F&O L2-01, L2-02, L2-05
LERF Analysis	LE-C4	Yes	L2-04, L2-05, L2-06	Response: See Draft Level 2 Report.	L2-R3, L2-R3 F&O L2-01, L2-02, L2-04
LERF Analysis	LE-C5	Yes	L2-07, L2-11, L2-25, AS-20, AS-21	Response: See Draft Level 2 Report.	L2-R4, AS-R9 F&O L2-05
LERF Analysis	LE-C6	Yes	L2-12, L2-24, L2-25	Response: See Draft Level 2 Report.	L2-R8 F&O L2-05
LERF Analysis	LE-C7	Yes	L2-07, L2-11, L2-12, L2-24	Response: See Draft Level 2 Report.	L2-R4, L2-R8 F&O L2-05
LERF Analysis	LE-C8	Yes	L2-11, L2-12	Response: See Draft Level 2 Report.	F&O L2-05
LERF Analysis	LE-C9	Yes	L2-11, L2-12, L2-16, L2-24, L2-25, AS-20	Response: See Draft Level 2 Report.	L2-R3, L2-R8, AS-R9 F&O L2-05
LERF Analysis	LE-C10	No		Response: See Draft Level 2 Report.	
LERF Analysis	LE-D1	Yes	L2-14, L2-15, L2-16, L2-17, L2-18, L2-19, L2-20, ST-05,	Response: See Draft Level 2 Report.	L2-R7, L2-R3, L2-R8 F&O L2-01, L2-02, L2-03

PRA Technical Element	ASME SR	Included in NEI 00-02	NEI-00-02 ELEMENTS	STP Evaluation	Peer Review
			ST-06		
LERF Analysis	LE-D2	No		Response: See Draft Level 2 Report.	
LERF Analysis	LE-D3	Yes	IE-14, ST-09	Response: See Draft Level 2 Report.	IE-R6, ST-R3 F&O IE-02, IE-03, ST-01
LERF Analysis	LE-D4	No		Response: See Draft Level 2 Report.	
LERF Analysis	LE-D5	No		Response: See Draft Level 2 Report.	
LERF Analysis	LE-D6	Yes	L2-16, L2-18, L2-19, L2-24, L2-25	Response: See Draft Level 2 Report.	L2-R3, L2-R7, L2-R8 F&O L2-03, L2-05
LERF Analysis	LE-E1	No	L2-05, L2-11, L2-12	Response: See Draft Level 2 Report.	L2-R3 F&O L2-01, L2-02, L2-04, L2-05
LERF Analysis	LE-E2	Yes	L2-12, L2-13, L2-17, L2-18, DA-04, HR-15, L2-19, L2-20	Response: See Draft Level 2 Report.	L2-R7, L2-R8 F&O L2-01, L2-02, L2-03, DA-02
LERF Analysis	LE-E3	Yes	QU sub-elements applicable to LERF	Response: See Draft Level 2 Report.	
LERF Analysis	LE-F1	Yes	QU-08, QU-09, QU-10, QU-11, QU-31	Response: See Draft Level 2 Report.	QU-R13 F&O AS-10, HR-06, HR-07, QU-02, QU-05
LERF Analysis	LE-F2	No	QU-27	Response: See Draft Level 2 Report.	QU-R9 F&O QU-03
LERF Analysis	LE-G1	Partial	L2-26, L2-27, L2-28	Response: See Draft Level 2 Report.	L2-R9, L2-R10
LERF Analysis	LE-G2	Partial	L2-26, L2-27, L2-28	Response: See Draft Level 2 Report.	L2-R9, L2-R10
LERF Analysis	LE-G3	Partial	L2-26, L2-27, L2-28	Response: See Draft Level 2 Report.	L2-R9, L2-R10
LERF Analysis	LE-G4	Partial	L2-26, L2-27, L2-28	Response: See Draft Level 2 Report.	L2-R9, L2-R10
LERF Analysis	LE-G5	Partial	L2-26, L2-27, L2-28	Response: See Draft Level 2 Report.	L2-R9, L2-R10
LERF Analysis	LE-G6	Partial	L2-26, L2-27, L2-28	Response: See Draft Level 2 Report.	L2-R9, L2-R10
LERF Analysis	LE-G7	Partial	L2-26, L2-27, L2-28	Response: See Draft Level 2 Report.	L2-R9, L2-R10
LERF Analysis	LE-G8	Partial	L2-26, L2-27, L2-28	Response: See Draft Level 2 Report.	L2-R9, L2-R10

Attachment 4

Key Assumptions and Approximations

Identification of Key Assumptions and Approximations

The following are key sources of uncertainty in the STP PRA. Sensitivity analyses for the key sources of uncertainty are being performed.

1. Reactor Coolant Pump Seal LOCA Modeling – The STP PRA uses a Rhodes model for seal LOCA behavior, which is incorporated into loss of offsite power (LOOP) and station blackout (SBO) recovery to determine key timing issues. Seal LOCA as a result of loss of cooling (i.e., component cooling water) is not a significant contributor at STP due to unique plant design features, including improved reactor coolant pump seal O-rings, a diesel-backed positive displacement charging pump that is independent from other cooling requirements, and high pressure injection pumps that are independent of component cooling water for injection and independent of external room cooling (one train only).

2. HRA Modeling – HRA modeling is described in Attachment 2.

3. SBO Recovery – LOOP and SBO are leading contributors to CDF and LERF at STP. Offsite power recovery was updated for the last model, STP_REV4. Sensitivity studies using different estimates of offsite power recovery under uncertain grid conditions (from deregulation) have not been performed. These sensitivity studies will be completed in support of the next model revision.

4. Balance of Plant (BOP) Modeling for Post-Trip Response – The STP PRA does not include BOP systems in the current PRA, which was a peer review finding. Sensitivity studies under different assumptions for operation of BOP systems after a plant trip are being performed. BOP system models will be incorporated in the next PRA update.

Attachment 5

Resolution of Peer Review Comments

Resolution of Peer Review Comments

In April 2002, the STP PRA underwent an industry peer review performed in accordance with NEI-00-02, "Industry PRA Peer Review Process." All technical elements within the scope of the peer review were graded as sufficient to support applications requiring the capabilities of a Grade 2 (risk-ranking applications). Several other technical elements were further graded as sufficient to support applications requiring the capabilities defined for Grade 3 (risk-informed applications supported by deterministic insights). The overall assessment of the peer reviewer was that the STP PRA could effectively be used to support applications involving risk-significance evaluations supported by deterministic input once the items noted in the technical element summaries and in the Fact & Observations (F&O) sheets were addressed appropriately for specific applications.

STPNOC is using its Corrective Action Program as a tracking mechanism for resolving the items identified by the peer review team. Most F&O items identified by the peer team have been completed and incorporated into the latest revision of the STP PRA (Revision 4). Other F&O items are currently being addressed and will be completed in 2005 prior to the implementation phase of RITS 4B. The STP PRA Revision 4 model is the basis for this application of Risk-Informed Technical Specifications. The full report of the peer review is available in the archival information.

Table 2 provides the results of the Peer Review and identifies F&O items that were generated. F&O items that are highlighted in Table 2 are Significance Level A or Significance Level B.

CRITERIA CATEGORY	NEI-00-02 DESIG	ASME SR DESIG	NEI CRITERIA	PRA Grade	Contingent PRA Grade	Related Facts & Obs.	Supporting Criteria and Notes
GUIDANCE	IE-01		Describes the process used	3			R1
	IE-02		Consistent with industry practices	3			R2
	IE-03		Sufficient detail provided for reproducing the evaluation	3			R11
IDENTIFICATION AND GROUPING	IE-04		Grouped initiators by plant response consistent with event tree structure and success criteria.	3			R3
	IE-05	IE-A9	The class of initiating events that is caused by failure of part or all of a system that supports the front-line safety function are addressed: - Cooling water systems (e.g., service water, component cooling water, etc.) - AC Power - DC Power - HV		3	IE-01	R5
	IE-06		For multi-unit sites with shared systems, the impact of initiators requiring simultaneous response (e.g., LOOP, loss of cooling source due to ice, loss of an AC or DC bus, etc.) are included	--	--		NA, R12
	IE-07		Initiators considered cover the spectrum of internal event challenges	3			R2, R3
	IE-08		All experienced initiators are accounted for in the model	3			R8
	IE-09		If typical initiators cited in NUREG-1150 or industry PSAs have been excluded, the basis is documented	3			R9
	IE-10		A structured approach for plant support systems is performed to determine if a loss of support system initiator presents a unique challenge to the plant	3		IE-04	
SUBSUMED INITIATING EVENTS	IE-11(3)		Treatment of subsumed initiating events is traceable	3			R4
	IE-12		Subsumed initiating events are included, in non-risk significant sequences or non-risk significant initiators	3			R4
DATA	IE-13		Initiating event frequencies and recovery are consistent with industry experience or analysis	3			R10
	IE-14		The features that lead to the frequency of interfacing system LOCA (e.g., surveillance test practices, start up procedures, etc.) are modeled explicitly or identified in the PSA documentation.		3	IE-02, IE-03	R6
	IE-15(3)	IE-C11	Plant specific features are reflected in the initiating event frequency and recovery inputs where appropriate	3			R13
	IE-16(3)	IE-C2	Plant specific experience is reflected in the initiating event definitions and frequency plus recovery inputs where appropriate	3			R7
	IE-17		A systematic process is used to identify the need for and application of techniques such as plant specific models or FMEAs, to quantify initiating event frequencies and recovery. (See also SY-21)	3		IE-04	R14

CRITERIA CATEGORY	NEI-00-02 DESIG	ASME SR DESIG	NEI CRITERIA	PRA Grade	Contingent PRA Grade	Related Facts & Obs.	Supporting Criteria and Notes
DOCUMENTATION	IE-18		Documentation provides the basis of the quantified values and is traceable		3	IE-02	R11
	IE-19		Documentation reflects the process used	3			
	IE-20		Documentation provides the basis for the initiating event frequency groupings	3			
	IE-21		Independent review provided for the documented results	3			
GUIDANCE	AS-01		Describes the process used	3			R13
	AS-02		Consistent with industry practices	3			R13
	AS-03		Sufficient detail provided for reproducing the evaluation	3			R13
ACCIDENT SCENARIO EVALUATION	AS-04		The event trees reflect the initiating event groupings	3		AS-01	R1
	AS-05		The models and analysis are consistent with the as-built plant (as could be confirmed during the Peer Review process)(6)	3			R2
	AS-06		The necessary critical safety functions are modeled in each sequence		3	AS-03, AS-09	
	AS-07		All relevant systems are credited for each function		3	AS-10, SY-06	
	AS-08		The branching structure and transfers among event trees maintain and resolve the failure paths	3		AS-06	R3
	AS-09		Success paths are defined correctly		3	AS-04, AS-06, TH-04	
	AS-10		Dependencies among top events are identified and addressed	4		AS-05, AS-06	
	AS-11		The method of treating dependencies is documented and consistently applied to capture the dependencies among top events.	4		AS-02, AS-06	
	AS-12		PWRs: An appropriate model for the reactor coolant pump seal LOCA, which may result from a loss of seal cooling due to various causes, is used and documented. Appropriate seal cooling dependencies are considered.		3	AS-08	
	AS-13		Time phased evaluation is included for sequences with significant time dependent failure modes (e.g., batteries for SBO, PWR RCP seal LOCA) and significant recoveries (e.g., AC recovery for SBO)	3			R4
	AS-14		Functions and structure are adequate to discriminate among plant conditions necessary for Level 2 analysis	3			R5
	AS-15		Transfers among event trees are performed correctly to avoid loss of information in the transfer	3			R3
	AS-16		System/component repair and recovery, if included in the accident sequences, are correctly modeled	3			R6
SUCCESS CRITERIA	AS-17		Functional success criteria are identified	3			R7

CRITERIA CATEGORY	NEI-00-02 DESIG	ASME SR DESIG	NEI CRITERIA	PRA Grade	Contingent PRA Grade	Related Facts & Obs.	Supporting Criteria and Notes
SUCCESS CRITERIA BASES	AS-18(7)		Success criteria are based on a combination of generic realistic and plant-specific realistic thermal hydraulic analyses	3			R8
INTERFACE WITH EOPs/AOPs	AS-19		Reflects the EOPs and AOPs. (The functions and structure of the event trees are consistent with the EOPs and abnormal procedures). (See also SY-5)	3		AS-07	R12
ACCIDENT SEQUENCE END-STATES (PLANT DAMAGE STATES)(5)	AS-20		The development of plant damage states, their relationship to functional failures, and their relationship to Level 1 event tree end states or linked fault tree cut sets is documented.	--	--		NA, R9
	AS-21		Plant damage states are sufficient to support the transfer of information to Level 2	--	--		NA, R9
	AS-22		Plant damage states are based on a clear, consistent definition of CDF that is consistent with industry usage	3		TH-01	R10
	AS-23		Plant damage states are based on mission time of 24 hours or separately justified	3			R11
DOCUMENTATION	AS-24		Documentation provides the basis of event tree structure and is traceable to plant specific or generic analysis		3	SY-08, TH-04	
	AS-25		Documentation reflects the process used	3			
	AS-26		Documentation includes an independent review for the documented results	3			
GUIDANCE	TH-01		Describes the process used		3	TH-06	
	TH-02		Consistent with industry practices	3		TH-01	R1
	TH-03		Sufficient detail provided for reproducing the evaluation	3		TH-06	R4
T&H ANALYSES	TH-04(1)		Combination of Generic realistic and Plant-specific realistic thermal hydraulic analysis are used	3			R5
MULTIPLE T&H INPUTS	TH-05		A combination of plant specific, generic and FSAR calculations are used to support success criteria and HRA timing.	2		TH-05, HR-07, SY-08	R6
GENERIC ASSESSMENTS	TH-06		Application of the generic assessments account for limitations of the generic analysis when applied to the specific plant		3	TH-07, TH-03, AS-04	R7
BEST ESTIMATE CALCULATIONS (e.g., MAAP, RETRAN, SAFER-GESTER)	TH-07		Application of the T & H codes account for the limitations of each of the codes		3	TH-03	R3
ROOM HEATUP CALCULATIONS	TH-08		Documented evaluation available to support the modeling decisions.	3		TH-02	R2
DOCUMENTATION	TH-09		Documentation provides the basis of the Thermal Hydraulic Analysis, is traceable to plant specific or generic analysis, and demonstrates the reasonableness of the success criteria.		3	TH-04, TH-05, SY-08	R8
	TH-10		Documentation reflects the process used	3			R9
	TH-11		Documentation includes an independent review for the documented results	3			R10

CRITERIA CATEGORY	NEI-00-02 DESIG	ASME SR DESIG	NEI CRITERIA	PRA Grade	Contingent PRA Grade	Related Facts & Obs.	Supporting Criteria and Notes
GUIDANCE	SY-01		Describes the process used		3	SY-01	R1
	SY-02		Consistent with industry practices	3			R2
	SY-03		Sufficient detail provided for reproducing the evaluation	3			R3
SYSTEM MODELS (e.g., Fault Trees)	SY-04		The system models are available for review	3			R4
	SY-05		The models and analyses are consistent with the as-built, as-operated plant including EOPs and AOPs (See also AS-19)		3	SY-05	R5
	SY-06		The structure of the system model provides detail down to at least the major active component level (e.g., pumps and valves)		3	SY-06	R6
	SY-07		The level of detail of the system models reflects certain passive components that may impact CDF.(6)	3			R7
	SY-08		The system models contain at a minimum the following (if applicable): - Common cause failure contributors - Test and maintenance unavailabilities - Operator errors that can influence system operability (where appropriate) - False instrument signals that can cause failures of the system - Operator interface dependencies across systems or trains	3			R8
	SY-09		Modules used in the system models are well correlated to their constituent components and capable of providing importance and parametric effects on a component level.	3		SY-07	R9
	SY-10		Spatial or environmental dependencies (e.g., internal floods, room cooling, etc.) are addressed for each system within the system model or in the accident sequence evaluation.(5)	3			R10
	SY-11		In some accident sequences, systems are expected to perform in degraded environments (e.g., inside containment after a LOCA). While equipment is generally qualified for such an environment, there should be some evidence that a search has been made for equipment that is not so qualified (e.g., statements that necessary equipment is qualified.) Other examples of degraded environments include: - Steamline breaks outside containment - Debris that could plug screens/filters (both internal and external to the plant), and - heating of the water supply (e.g., PWR containment sump) that could affect pump operability		3	SY-09	R11
	SY-12		Support system requirements are accounted for	4		AS-06	R12
	SY-13		The inventories of air, power, and cooling sufficient to support the mission time (or potential deficiencies)	3			R13

CRITERIA CATEGORY	NEI-00-02 DESIG	ASME SR DESIG	NEI CRITERIA	PRA Grade	Contingent PRA Grade	Related Facts & Obs.	Supporting Criteria and Notes
			are identified and included in the model as appropriate. (Also refer to Elements TH and DE regarding definition of success criteria)				
	SY-14		The system boundary included in the system model is clearly discerned from a simplified schematic of system	2		SY-03	R14
	SY-15		The system model analysis considered generic system failure modes observed in industry(9)	3			R15
	SY-16		The system model analysis included plant specific failure modes(7), (9)	3		SY-04	R16
SYSTEM MODELS (e.g., Fault Trees) continued	SY-17(11)		Combination of Generic realistic and Plant-specific realistic thermal hydraulic analysis		3	SY-02, SY-08	R17
	SY-18		The system model nomenclature is developed in a consistent manner to allow model manipulation and to represent the same designator when a component failure mode is used in multiple systems or trains.	3			R18
	SY-19		The systems used in the event trees have detailed system model development to support them unless they are generally treated with point estimate values, e.g.,: - RPS - Diesel Generators - Switchyards The following impact on grades is suggested for the above sample items (4): - Conditional Probabilities (Split Fractions)	3			R19
	SY-20		The system models(4) are used to quantify the accident sequences by: - Conditional Probabilities (Split Fractions)	3			R20
	SY-21		The impact of the system model on initiating events has been examined (see also IE-10, IE-17)	3			R21
	SY-22		The assumptions for the system logic model are identified (12)	3			R22
	SY-23		The system operation under accident conditions is identified in the system notebook	3			R23
	SY-24		System/component repair and recovery actions and modeling, if used, are identified and documented (see also QU-18)	3			R24
DOCUMENTATION	SY-25		Reflects the process used	3			R25
	SY-26		Includes an independent review for the documented results	3			R26
	SY-27		Provides the basis of the system model and is traceable to plant specific or generic analysis	3			R27
GUIDANCE	DA-01		Describes the process used	3			R1
	DA-02		Consistent with industry practices	3			R2
	DA-03		Sufficient detail provided for reproducing the evaluation		3	DA-03	
FAILURE PROBABILITIES	DA-04		The random independent component failure probability data used in the evaluation and where it can be justified		3	DA-02	

CRITERIA CATEGORY	NEI-00-02 DESIG	ASME SR DESIG	NEI CRITERIA	PRA Grade	Contingent PRA Grade	Related Facts & Obs.	Supporting Criteria and Notes
			is based on accumulated plant specific experience; otherwise, realistic generic data is used.				
	DA-05		For plant specific data development, similar components have been grouped together in a reasonable manner and the grouping is supported by the documentation.	3			
	DA-06		For basic events derived using standby failure rate data, the plant specific surveillance test intervals have been identified and used in the analysis.	--	--		NA
SYSTEM/TRAIN MAINTENANCE UNAVAILABILITIES (1)	DA-07		The system/train maintenance unavailabilities are derived based on plant specific data.	3			R3
COMMON CAUSE FAILURE PROBABILITIES	DA-08		The common cause failure probabilities are referenced to acceptable data sources.(2)	2		DA-01	R7
	DA-09		The common cause failure probabilities are realistic based on generic data source comparisons.	3			R8
	DA-10		Common cause groups to which the common cause failure probability applies have been derived based on sound judgment and are documented.	3			R9
	DA-11		Justification is provided for treatment of common cause failure of on-site AC sources. Treatment includes consideration of: (4) - Design diversity - Common maintenance crews - Common I&C technicians - Similarity of procedures - Common fuel oil - Common Heating/Cooling Designs	3			R10
	DA-12		NUREG/CR-4780 (EPRI NP-5613 or equivalent) systematic approach used to provide plant specific grouping of similar system components for CCF treatment	3			R9
	DA-13		Dominant contributors for sequences include MGL for more than 2 redundant trains (5)	4			R11
	DA-14		Full intent of NUREG/CR-4780 (EPRI NP-5613 or equivalent) included: - Plant specific screening of common cause data.	4			R12

CRITERIA CATEGORY	NEI-00-02 DESIG	ASME SR DESIG	NEI CRITERIA	PRA Grade	Contingent PRA Grade	Related Facts & Obs.	Supporting Criteria and Notes
UNIQUE UNAVAILABILITIES OR MODELING ITEMS	DA-15		Documentation and bases are provided for the failure probabilities from plant specific or generic sources that do not fit into the basic event database, e.g.:(6) - AC Power Recovery - EDG Mission Time - Repair and Recovery Model - LOOP Given Transient - BOP Unavailability - Pipe/Tank Rupture Failure Probability - ATWS Related RPS Failures - RCP Seal Failure (for PWRs) - % of time Pressurizer PORVs Blocked during operation (PWRs) - PORV demand probability given an initiating event - % of time SG PORVs or atmospheric dump valves blocked during operation	3			R4
	DA-16		The unique unavailabilities are based on:(7) - These failure probabilities are justified to the current state of the technology	3			R4
DOCUMENTATION	DA-17		Reflects the process used	3			
	DA-18		Includes an independent review for the documented results	3			R5
	DA-19		Provides the basis of the data treatment and is traceable to plant specific or generic analysis.			DA-03, DA-04	
	DA-20		The generic and plant specific databases are available for inspection and use.	3			R6
GUIDANCE	HR-01		Describes the process used	3			R1
	HR-02		Consistent with industry practices	2		HR-02, HR-03	R2
	HR-03		Sufficient detail provided for reproducing the evaluation	3			R1
PRE-INITIATOR HUMAN ACTIONS	HR-04		Pre-initiator Human Interactions (HIs) were considered in the PRA	3			R3
	HR-05		A systematic process is used to identify the Pre-Initiator Human Errors to be included in the PRA (e.g., miscalibration of instruments)		3	HR-01	R3
	HR-06		Best estimate HEPs are used in the quantification of pre-initiator HEPs for dominant contributors	2		HR-04	R4
	HR-07		Those pre-initiator actions with the possibility of adversely impacting baseline CDF or LERF are included in the quantification.	3			R3, R5
POST-INITIATOR HUMAN ACTIONS	HR-08		Post-initiator HIs were considered in the PRA	3			R6
	HR-09		A systematic process is used to identify the Post-Initiator Human Errors to be included in the PRA.	3			R6
	HR-10(3)		Assessment of plant procedures and plant specific operating experience are explicitly included in the identification and quantification process for the HIs.	3			R6

CRITERIA CATEGORY	NEI-00-02 DESIG	ASME SR DESIG	NEI CRITERIA	PRA Grade	Contingent PRA Grade	Related Facts & Obs.	Supporting Criteria and Notes
	HR-11		The symptoms available during the postulated accident sequence are evaluated and input into the HRA process.	3		TH-05	R7
	HR-12		HEP values are internally consistent within the PRA.	3			R8
	HR-13(1)		Screening HEPs are internally consistent within the PRA	--	--		NA
	HR-14		Operator actions have been reviewed by the operating staff and their impact is included in the HRA evaluation		3	HR-07	R9
	HR-15(1)		Best estimate HEPs are used in the quantification of dominant contributors.	3			
	HR-16(2)		Emphasis of the Human Reliability Analysis is to identify that the HI is folded correctly into the model and that the HI: - Reflects the procedures (EOPs & AOPs)	2		HR-04	R10
	HR-17		The performance shaping factors such as time available, time to perform, stress, complexity, etc. are included in the quantification.	4		HR-05	R11
	HR-18		The performance shaping factor for time available for an action and the time required to take an action are developed on a plant specific basis.		3	HR-07, TH-05	
	HR-19		Time available for action is based on: - plant-specific T & H analysis	3			R12
	HR-20		The time required to complete the actions is based on observation or operations staff input.	3			R13
	HR-21		The recovery actions are included systematically in the model	3			R14
	HR-22		The models and analysis are consistent with the operating procedures and training.	1		HR-04	
	HR-23		Operator actions including recovery are not credited unless a procedure is available or operator training has included the action as part of crew's training.	3			R6
	HR-24		Inter-unit cross-ties are only credited if procedures and training are available.	--	--		NA, R15
	HR-25		Inter-unit cross-ties are accurately accounted for under conditions of outage for the other unit and special initiating events.	--	--		NA, R15
DEPENDENCE AMONG ACTIONS	HR-26		The dependence among human actions is evaluated in the PSA process.	3			R16
	HR-27		Identification of sequences that, but for low human error rates in recovery actions, would have been dominant contributors to core damage frequency is included as a test of modeling adequacy. Equivalent techniques may also be used.	1		HR-06	R16
DOCUMENTATION	HR-28		Reflects the process used	3			R17
	HR-29		Includes an independent review for the documented results	3			R17

CRITERIA CATEGORY	NEI-00-02 DESIG	ASME SR DESIG	NEI CRITERIA	PRA Grade	Contingent PRA Grade	Related Facts & Obs.	Supporting Criteria and Notes
	HR-30		Provides the basis of the HRA and is traceable to plant specific or generic analysis.	--	--		NA, R17
GUIDANCE	DE-01		Describes the process used	3			R1
	DE-02		Consistent with industry practices	3			R1
	DE-03		Sufficient detail provided for reproducing the evaluation	3			R1
INTER SYSTEM DEPENDENCIES	DE-04		The dependencies of the front-line system to support systems and support systems to support systems are identified.(1)	4		DE-05	R2
SYSTEM / INITIATOR DEPENDENCIES	DE-05		The dependencies of the support systems and front-line systems to the initiating events are identified	4		DE-05	R3
METHODOLOGY	DE-06		Support system and system to system interactions are treated in the event trees or linked fault trees. (See Element AS-6)	4		DE-06	R4
HUMAN INTERACTIONS	DE-07		The human interactions that can cut across system trains and can cause failure of multiple trains due to pre-initiator and post initiator human interactions (HIs) are identified and documented. (See Element HR-26). Examples include: - Common cause miscalibration of similar sensors - Operator procedure-based actions to terminate injection	--	--		NA, R5
COMMON CAUSE	DE-08		Similar components within a system are included in a common cause group. (See Element DA-10)	--	--		NA, R7
	DE-09		NUREG/CR-4780 methodology or equivalent is used to develop the component groups, OR NUREG/CR-4780 methodology or equivalent supported by plant specific operating experience is used to ensure grouping is adequate OR Full NUREG/CR-4780 Application or its equivalent (See Elements DA-12 and DA-14)	--	--		NA, R8
SPATIAL DEPENDENCIES	DE-10		Spatial challenges that can result in dependencies among components are included in the model for: - Flooding - High temperature - Inadvertent sprinkler operation - Missiles (HPCI/RCIC turbines for BWRs, turbine-driven EFW/AFW pumps for PWRs) - Intake anomalies (e.g., ice frazil, bio-fouling)	4		DE-06	R9
WALKDOWN	DE-11		Specifically examines the spatial dependencies that could affect the system or intersystem reliabilities or initiating events.	2			R6, R11
DOCUMENTATION	DE-12		Reflects the process used; For Internal Flooding, documentation reflects the process used to identify flood sources, flood pathways, flood scenarios, and their screening and	2		DE-08	

CRITERIA CATEGORY	NEI-00-02 DESIG	ASME SR DESIG	NEI CRITERIA	PRA Grade	Contingent PRA Grade	Related Facts & Obs.	Supporting Criteria and Notes
			internal flood modeling				
	DE-13		Includes an independent review for the documented results	3			
	DE-14		Provides the basis of the dependency treatment and is traceable to plant specific or generic analysis.		3	DE-08	
AREAS AND SSC'S INVOLVED	IF-04	IF-A1	Plant is divided into physically separate or combined flood areas generally on the same elevation. - Presence of physical barriers identified (e.g., walls, floors, dikes, watertight doors) - Mitigation features (e.g., sumps and drains) identified Propagation pathways are identified (e.g., open hatches, doors)		3	DE-01	
	IF-05	IF-A2	SSC's located in each flood area are identified, including mitigating features (e.g., shielding) for SSC's which can challenge normal plant operations.	4			IF-5
	IF-06	IF-A3, IF-A4	Plant walkdown is performed to verify information obtained from plant sources (e.g., drawings, operator interviews) spatial information, SSCs located in flood areas, and potential flood sources in the areas.	3			IF-6
FLOODING SOURCES AND MECHANISMS	IF-07	IF-B1	Potential sources for flooding water are identified, including : - Equipment in the area (e.g., pipes, valves, pumps) connected to fluid systems (e.g., circulating water systems, service water, feed water, reactor cooling water) - Plant internal sources (e.g., tanks or pools), and - External sources (rivers or reservoirs) connected to the area through some system or structure.		3	DE-02	IF-7
	IF-08	IF-B2	Flooding mechanisms from each potential flooding water source are identified (e.g., pipe break, human error in overfill of tanks, inadvertent actuation of fire suppression systems, maintenance errors, any other events which could release water in the area.)	2		DE-03	IF-7
	IF-09	IF-B3	For each flooding mechanism the type of water release and capacity are identified: - Breach (e.g., leak, rupture, spray) - Flow rate of water, Capacity (e.g., gallons of water source), and - Characterization of flow (e.g., spray, jet, potential for pipe whip)	2		DE-04	IF-9
FLOODING SOURCES AND MECHANISMS	IF-10	IF-B4	In each flood area the capacity of drains and sumps is identified.	--	--	DE-04	NA, IF-10

CRITERIA CATEGORY	NEI-00-02 DESIG	ASME SR DESIG	NEI CRITERIA	PRA Grade	Contingent PRA Grade	Related Facts & Obs.	Supporting Criteria and Notes
POTENTIAL FLOODING SCENARIOS	IF-11	IF-C1	Propagation path for each flood source is identified including: - Normal flow path via drain lines - Back flow through drain lines with failed check valves - Pipe and cable penetrations - Doors - Stairwells - Hatchways - Structural failure of doors or walls, and - HVAC ducts.	2		DE-01	IF-11
	IF-12	IF-C2	Plant design features or operator actions that can mitigate or terminate flood propagation are identified and justified. Included availability of flood alarms, dikes, curbs, drains, sumps, shields, water-tight doors, and operator actions.	--	--		NA, IF-12
	IF-13	IF-C3	Susceptibility of each SSC in the flood area to flood induced failure mechanisms is identified and any exclusions are justified. Included are submergence, impingement, spray, pipe whip, resulting area dampness, etc.	3			IF-13
POTENTIAL FLOODING SCENARIOS (continued)	IF-14	IF-C4	Flood scenarios are developed by examining propagation paths. Scenarios verified by walkdowns.	--	--		NA, IF-14
	IF-15	IF-C5	Flooding scenarios are screened in areas where: - There is no mitigating equipment modeled in the PRA or equipment failure does not cause an initiating event - There is no significant flooding potential, and - There are adequate mitigating systems	3			IF-14
	IF-16	IF-C6	Flooding scenarios are screened where the time to damage of safe shutdown equipment is greater than 2 hours, if there is flood indication in the control room and flood sources can be isolated, OR Mitigating action can be performed with high reliability for the worst flooding initiator, OR No screening is performed for scenarios that rely on operator action for mitigation	--	--		NA, IF-14
FLOODING INDUCED INITIATING EVENTS AND THEIR FREQUENCIES	IF-17	IF-D1	Flood initiators that challenge normal plant operation have been identified, including the potential for flooding induced transient or LOCA.	--	--		NA

CRITERIA CATEGORY	NEI-00-02 DESIG	ASME SR DESIG	NEI CRITERIA	PRA Grade	Contingent PRA Grade	Related Facts & Obs.	Supporting Criteria and Notes
	IF-18	IF-D2	Impact of plant specific initiating event precursors and system alignments is not evaluated. OR For included flood-induced initiating events, the impact of plant-specific initiating event precursors and system alignments, and alignments of supporting systems are addressed.	--	--		NA, IF-14
	IF-19	IF-D3	Initiators are grouped only when: Events can be considered similar in terms of plant response, success criteria, and timing; OR Events can be subsumed into a group and bounded by the worst case impacts within the "new" group. Induced initiating events grouped only when: Events can be considered similar in terms of plant response, success criteria, and timing, and the effect on the operability and performance of operators and relevant mitigating systems; or Events can be subsumed into a group and bounded by the worst case impacts within the "new" group.	--	--		NA
continued	IF-19						
FLOODING INDUCED INITIATING EVENTS AND THEIR FREQUENCIES (continued)	IF-20	IF-D4	For multi-unit sites with shared systems, a qualitative evaluation has been performed to ensure that relative risk significance of modeled SSC's is not distorted if multi-unit flood initiators are excluded OR For multi-unit sites with shared systems dual unit flood initiators are treated and quantified explicitly.	--	--		NA
	IF-21	IF-D5	Flooding initiating event frequencies are determined by criteria specified in high level requirement IE-C of the ASME PRA Standard, generic data sources, and plant specific sources. OR Flooding initiating event frequencies are determined by criteria specified in supporting requirement IE-C1-5 of the ASME PRA Standard and generic data enhanced by plant specific operating experience, or a combination of one of the above with expert judgement.	2		DE-07	IF-15
	IF-22	IF-E1	The accident sequence results developed in AS are reviewed and modified as necessary to account for any flood-induced phenomena.	--	--		NA
QUANTIFICATION OF FLOODING INDUCED ACCIDENT SEQUENCES	IF-23	IF-E2	Engineering calculations for flood rate, time to reach vulnerable equipment, and structural capacity of SSC's per Success Criteria have been performed.	--	--	DE-04	NA
	IF-24	IF-E3	The systems analysis results obtained by following the applicable have been	--	--		NA

CRITERIA CATEGORY	NEI-00-02 DESIG	ASME SR DESIG	NEI CRITERIA	PRA Grade	Contingent PRA Grade	Related Facts & Obs.	Supporting Criteria and Notes
			reviewed to include flood-induced failures.				
	IF-25	IF-E4	Additional data analysis performed to the applicable requirements for Human Reliability.	--	--		NA, IF-12
	IF-26	IF-E5	Human reliability analyses were performed including PSFs for: (a) Additional workload, (b) Uncertainties for event progression, and (c) Effect of flooding on mitigation, required response, and flooding-specific job aids and training.	--	--		NA, IF-12
	IF-27	IF-E6	Flood sequence quantification has been performed, including quantitative screening and both direct and indirect failures caused by flooding.	2		DE-09	
	IF-28	IF-E7	Level 2 and LERF analyses were reviewed to account for flood induced phenomena.	--	--		NA
QUANTIFICATION OF FLOODING INDUCED ACCIDENT SEQUENCES (continued)	IF-30	IF-F2	The following Internal Flooding results are documented: - flood sources identified in the analysis, any rules used to screen out these sources, and the resulting list of sources to be further examined; - flood areas used in the analysis and the reason for eliminating any of these areas from further analysis; - propagation pathways between flood areas and any assumptions, calculations, or other bases for eliminating or justifying any of these propagation pathways; - accident mitigating features and barriers credited in the analysis, the extent to which they were credited, and associated justification; - component fragilities and any associated assumptions or calculations used in the determination of the impacts of submergence, spray, temperature, or other flood-induced effects on equipment operability; - screening criteria used in the analysis;	--	--		NA
	IF-30 (continued)		- flooding scenarios considered, screened, and the remaining scenarios, as well as how the internal event analysis models were modified to model these remaining scenarios for the internal flooding analysis				
GUIDANCE	ST-01		Describes the process used	3			R1
	ST-02		Consistent with industry practices	3			R1
	ST-03		Sufficient detail provided for reproducing the evaluation	3			R1
RPV CAPABILITY (ATWS)	ST-04		Best estimate failure condition considered (ASME Service Level C used)		3	TH-03	R2
CONTAINMENT	ST-05		Conservative estimate of failure probability is used OR Realistic estimate of failure probability	--	--		NA, See L2

CRITERIA CATEGORY	NEI-00-02 DESIG	ASME SR DESIG	NEI CRITERIA	PRA Grade	Contingent PRA Grade	Related Facts & Obs.	Supporting Criteria and Notes
			is used based on detailed plant specific structural examination				
	ST-06		Level 2 analysis considers multiple pathways from the containment	--	--		NA, See L2
REACTOR BUILDING (for BWRs)	ST-07		Blowout panels considered	--	--		NA
	ST-08		Level 2 analysis considers multiple pathways from the reactor building	--	--		NA
PIPE OVERPRESSURE (ISLOCA)	ST-09		Conservative estimate is used OR Generic realistic estimate is used OR Plant specific realistic estimate is used	--	--	ST-01, IE-03	NA, R3
FLOOD BARRIER INTEGRITY	ST-10		Internal flooding analysis considers flood barrier (e.g., doors) structural capability and features when these barriers are credited for limiting flood propagation	--	--	DE-01	NA, R4
DOCUMENTATION	ST-11		Reflects the process used	3			R1
	ST-12		Includes an independent review for the documented results	3			R1
	ST-13		Provides the basis of the treatment and is traceable to plant specific or generic analysis.	3			R1
GUIDANCE	QU-01		Describes the process used	3			R11
	QU-02		Consistent with industry practices	3			
	QU-03		Sufficient detail provided for reproducing the evaluation	3			
CODE	QU-04		The base computer code and its inputs have been tested and demonstrated to produce reasonable answers.(3), (4)	3			
	QU-05		The simplified model (cutset model) is demonstrated to produce reasonable results for typical applications. (2)	--	--		NA
	QU-06		Applications are not limited by the capabilities of the computer code.		3	QU-01	
SIMPLIFIED MODEL	QU-07		The simplified model (e.g., solved cutset) limitations are clearly identified.	--	--		NA
DOMINANT SEQUENCES/CUTSETS	QU-08		The dominant cut sets or sequences(1) - Make physical sense		3	AS-10	R13
	QU-09		Include common cause potential where appropriate	3			R1
	QU-10		Include dependency among human actions when multiple HEPs are in the same cut set or sequence		3	HR-06, HR-07	
	QU-11		Are not missing potentially dominant cut sets or sequences for similar plants. Possible reasons for differences include: (a) physical plant or procedural differences among plants; (b) documented assumptions; (c) detailed modeling or data to supplant assumptions		3	QU-05	

CRITERIA CATEGORY	NEI-00-02 DESIG	ASME SR DESIG	NEI CRITERIA	PRA Grade	Contingent PRA Grade	Related Facts & Obs.	Supporting Criteria and Notes
	QU-12		Asymmetry: The model asymmetry is well described in terms of: - modeling - plant support systems - normally running equipment - cross-ties to an adjacent unit.	3			R2
	QU-13		Asymmetry: Any modeling quantitative asymmetry (e.g., one train of dual-train system modeled as in-service, other in standby) is documented and is well understood so that applications affected by asymmetry can be determined.	3			R2
	QU-14		Circular logic can sometimes occur when using linked fault trees. The PSA process appropriately accounts for support system dependencies in a consistent fashion that avoids so-called circular logic. (5)	3			R3
NON-DOMINANT SEQUENCES/CUTSETS(1)	QU-15		The non-dominant cut sets or sequences: - Make physical sense	3			R14
	QU-16		- Include common cause potential or there are equivalent cut sets that do include the common cause potential	3			R1
	QU-17		- Include dependency among human actions when multiple HEPs are in the same cut set or sequence		3	HR-06	
RECOVERY ANALYSIS	QU-18		Recovery actions credited in the evaluation are either proceduralized or have reasonable likelihood of success when the Technical support Center / Emergency Operations Facility are manned.	3			
	QU-19		Recovery actions that are included in the quantification process are included in all applicable sequences and cut sets	3			R4
	QU-20		Transfers of sequences among event trees are treated explicitly.	3			R15
TRUNCATION	QU-21		There is evidence of consideration of the effects of quantification truncation values on the results. (6)	3			R5
	QU-22		Example truncation values used in a base PSA are given. The screening truncation of events or failure modes retained in the model are as follows for screened out events: < 0.00001 * CDF Base < 0.00001 * LERF Base	4			R6
	QU-23		The truncation values used in the system fault trees and accident sequences are sufficiently low to support their use in representative applications.	3			R8
	QU-24		There is evidence of convergence towards a stable result	3			R5
CUTSET COMPLEMENTS & MUTUALLY EXCLUSIVE EVENTS	QU-25		If the fault tree linking approach is used, "delete" terms (cutset complements) are used to account for the successes in event sequences as appropriate to assure that the correct cut sets are generated.	--	--		NA
	QU-26		The quantification process identifies	3			R7

CRITERIA CATEGORY	NEI-00-02 DESIG	ASME SR DESIG	NEI CRITERIA	PRA Grade	Contingent PRA Grade	Related Facts & Obs.	Supporting Criteria and Notes
			and deletes mutually exclusive cut sets.				
UNCERTAINTY	QU-27		A search is performed for unique or unusual sources of uncertainty not present in the typical or generic plant analysis.	2		QU-03	R9
	QU-28		If there are unusual sources of uncertainty, special sensitivity evaluations or quantitative uncertainty assessments are performed to support the base conclusion and future applications.	2		QU-03	R9
	QU-29		The capability to perform focused sensitivities to support the PSA applications is available.		3	QU-02	R12
	QU-30		A quantification of selected uncertainties is performed, or the impact of the selected uncertainties on the final risk measures is estimated.	3			R10
RESULTS SUMMARY	QU-31		The PSA results summary identifies the dominant contributors. (7)		3	QU-02, QU-04	
	QU-32		Reflects the process used.	3			R11
	QU-33		Includes an independent review for the documented results.	3			
	QU-34		Provides the basis and is traceable to plant specific or generic analysis.	3			
GUIDANCE	L2-01		Describes the process used	3			R1
	L2-02		Consistent with industry practices	3			R1
	L2-03		Sufficient detail provided for reproducing the evaluation	3			R1
SUCCESS CRITERIA	L2-04		The success criteria are identified	3			R2
	L2-05		The success criteria are supported by thermal hydraulic analysis, system capability evaluations, or industry studies		3	L2-01, L2-02, L2-04	R3
	L2-06		The success criteria are judged realistic	3			
L1/L2 INTERFACE	L2-07		The link between the Level 1 and Level 2 is sufficient and adequately documented to provide the transfer of information from the Level 1 analysis to the Level 2 containment evaluation.	3			R4
PHENOMENA CONSIDERED (1),(3)	L2-08		The phenomena that may control the LERF radionuclide release characterization are included.	2		L2-01, L2-02	
	L2-09(4)		(PWRs): If plant specific features are not consistent with those assumed in Owners Group SAMG analyses, the L2 model addresses any plant-specific phenomena that may affect accident management actions and planning.	3			R5
	L2-10		The phenomena that may influence applications are included.	2		L2-01, L2-02	R6
HEPs AND SYSTEM PERFORMANCE	L2-11		System performance has been evaluated to account for the adverse conditions that may be present during the core melt progression response.		3	L2-05	
	L2-12		Success of human actions has been evaluated to account for the adverse conditions that may be present during the core melt progression response.		3		

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	L2-13		Containment and system functional failures are treated realistically for dominant contributors	3		L2-03	
CONTAINMENT CAPABILITY ASSESSMENT	L2-14		Containment capability is analyzed under severe accident conditions for its survivability	3			R7
	L2-15		Both static and dynamic effects are included (2), (3)	3			R7
	L2-16		All postulated failure modes identified by IDCOR or NRC Staff in NUREG-1150 are considered (2), (3)	3			R3
	L2-17		For Ice Condenser and BWR Mark III containments only	--	--		NA
	L2-18		Both leakage and large failures are included in the analysis	3			R8
	L2-19		Containment failure modes are treated realistically in the analysis	3		L2-03	R7
	L2-20		The containment analysis is: - Conservative	2		L2-01, L2-02	
ENDSTATE DEFINITION	L2-21		The Level 2 end states support the applications currently envisioned.		3	L2-06	
LERF DEFINITION	L2-22		The LERF definition is consistent with the following guidance, and is documented: - PSA Applications Guide or other Owners Group-specific definitions (5)	3			
	L2-23		· The LERF definitions use Emergency Action Levels (EAL) bases if required; and the EAL bases are documented.		3	L2-07	
CONTAINMENT EVENT TREES (CETs)	L2-24		The CETs: - Include all the functional events required to meet a safe stable condition - Include the phenomena cited under phenomena.	3			R8
	L2-25		The CETs: - Include the systems and HEPs necessary - Are consistent with the EOPs - Include reasonable recovery actions.	3		L2-05	
DOCUMENTATION	L2-26		Documentation reflects the process used		3		R9
	L2-27		Includes an independent review for the documented results	3			R10
	L2-28		Provides the basis of the containment performance analysis and the analysis is traceable to plant specific or generic analysis.	3			R9
GUIDANCE	MU-01		Describes the process used	3			R1
	MU-02		Consistent with industry practices		3	MU-01	R2
	MU-03		Sufficient detail provided to update the evaluation		3	MU-01	R3

CRITERIA CATEGORY	NEI-00-02 DESIG	ASME SR DESIG	NEI CRITERIA	PRA Grade	Contingent PRA Grade	Related Facts & Obs.	Supporting Criteria and Notes
INPUT – MONITORING AND COLLECTING NEW INFORMATION (2)	MU-04		Each of the following information sources is part of the PSA update process for monitoring new information associated with the following: - Operational Experience - Plant Design - New Maintenance Policies - Operator Training Program - Technical Specifications - Revised Engineering Calculations - Emergency and Abnormal Procedures - Operating Procedures - Emergency Plan - Accident Management Programs - Industry Studies		3	MU-02, MU-05	R4
	MU-05		Plant specific data is included for quantitative reevaluation.	3			R4
MODEL CONTROL	MU-06		The computer models of the PRA are stored in a controlled manner. This also applies to sensitivity cases that may be performed to support a specific application.	4		MU-04	R5
COMPUTER CODE CONTROL	MU-07		Computer code controls are formalized to ensure that the effect on the PRA of changes to these codes are understood and addressed if appropriate	4		MU-04	R5
PRA UPDATE	MU-08		A process is in place to maintain the PRA. The PRA update model process consists of the elements identified and the steps in the process. The model update process consists of the following: - Identification of Affected Model Elements - Modification of PRA Models - Requantification of PRA Models - Evaluation of Results - Re-Evaluation of Past PRA Applications		3	MU-03, MU-05	R1, R2, R3, R4, R7
	MU-09		The plant has defined a fixed update schedule or a reasonable criteria upon which to base the need for an update.	3		MU-05	R6
EVALUATION OF RESULTS	MU-10		The PRA results are evaluated by knowledgeable personnel before the results are used.	3			R2
RE-EVALUATION OF PAST PRA APPLICATIONS (3)	MU-11		Past PRA Applications are evaluated qualitatively to assure that the conclusions remain valid.	--	--	MU-03	NA, R7
	MU-12		Past PRA Applications that may be affected by the latest information and update are re-performed.		3	MU-03	R7
DOCUMENTATION	MU-13		Documentation reflects the process used	3			R8
	MU-14		Includes an independent review for the documented results	3			R8
	MU-15		Provides the basis of the update process and the results are traceable to specific changes in design, procedures, training, or operating experience.	3			R8